CCGPS Frameworks 2nd Unit 2

Mathematics

Second Grade Unit Two
Becoming Fluent with Addition and Subtraction

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"Making Education Work for All Georgians"

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Unit Two: Becoming Fluent with Addition and Subtraction (6 Weeks)

TABLE OF CONTENTS (* indicates a new task)

OVERVIEW

In this unit students will:

- cultivate an understanding of how addition and subtraction affect quantities and are related to each other
- will reinforce the multiple meanings for addition (combine, join, and count on) and subtraction (take away, remove, count back, and compare)
- further develop their understanding of the relationships between addition and subtraction
- recognize how the digits 0-9 are used in our place value system to create numbers and manipulate amounts
- continue to develop their understanding solving problems with money

As students in second grade begin to count larger amounts, they should group concrete materials into tens and ones to keep track of what they have counted. This is the introduction of our place value system where students must learn that the digits (0-9) have different values depending on their position in a number.

Students in second grade now build on their work with one-step problems to solve two-step problems. Second graders need to model and solve problems and represent their solutions with equations. The problems should involve sums and differences less than or equal to 100 using the numbers 0 to 100. Picture Graphs and Bar Graphs are also introduced in second grade. Investigations and experiences with graphing should take place all year long.

Addition and Subtraction in Elementary School
(Information adapted from North Carolina DPI Instructional Support Tools)

- The strategies that students use to solve problems provide important information concerning number sense, and place value.
- It is important to look at more than answers students get. The strategies used provide useful information about what problems to give the next day, and how to differentiate instruction.
- It is important to relate addition and subtraction.
- Student-created strategies provide reinforcement of place value concepts. Traditional algorithms can actually "**unteach**" place value.
- Student created strategies are built on a student's actual understanding, instead of on what the book says or what we think/hope they know!
- Students make fewer errors with invented strategies, because they are built on understanding rather than memorization.

Students use various counting strategies, including **counting all, counting on, and counting back** with numbers up to 20. This standard calls for students to move beyond counting all and become comfortable at counting on and counting back. The counting all strategy requires students to count an entire set. The counting and counting back strategies occur when students are able to hold the start number in their head and count on from that number.

Although the units in this instructional framework emphasize key standards and big ideas at specific times of the year, routine topics such as counting, time, money, positional words, patterns, and tallying should be addressed on an ongoing basis. Additionally, the required fluency expectations for second grade students (knowing from memory all sums of two one digit numbers) should be a gradual progression. **The word *fluency*** is used judiciously in the Standards to mark the endpoints of progressions of learning that begin with solid underpinnings and then pass upward through stages of growing maturity. By doing this we are allowing students to gradually enhance their understanding of the concept of number and to develop computational proficiency.

PACING

The pacing of this unit is suggested. Please adjust the time according to the needs of your students. There are a multitude of meaningful tasks available in this unit. Time constraints in your classroom may limit the completion of all tasks. Please choose the ones best suited for your students.

This unit is length since building addition and subtraction fluency is one of the four critical areas for instruction in second grade. A significant amount of instructional time should be dedicated to these concepts. Learning acquired in this unit is built on in Unit 4.

It is anticipated that completing each task as written will take approximately 5 – 6 weeks. Naturally, you will adjust the tasks to meet the needs of your learners. As this unit is laying one of the foundations for second grade, plan on allotting a significant amount of instructional time.

NUMBER TALKS

Between 5 and 15 minutes each day should be dedicated to "*Number Talks*" in order to build students' mental math capabilities and reasoning skills. Sherry Parrish's book *Number Talks* provides examples of K-5 number talks. The following video clip from Math Solutions is an excellent example of a number talk in action. http://www.mathsolutions.com/videopage/videos/Final/Classroom_NumberTalk_Gr3.swf

During the Number Talk, the teacher is not the definitive authority. The teacher is the facilitator and is listening for and building on the students' natural mathematical thinking. The teacher writes a problem horizontally on the board in whole group or a small setting. The students mentally solve the problem and share with the whole group **how** they derived the answer. They must justify and defend their reasoning. The teacher simply records the students' thinking and poses extended questions to draw out deeper understanding for all.

The effectiveness of Numbers Talks depends on the routines and environment that is established by the teacher. Students must be given time to think quietly without pressure from their peers. To develop this, the teacher should establish a signal, other than a raised hand, of some sort to identify that one has a strategy to share. One way to do this is to place a finger on their chest indicating that they have one strategy to share. If they have two strategies to share, they place out two fingers on their chest and so on.

Number Talk problem possible student responses:

	Possible Strategy #1	Possible Strategy #2
29 + 8	29 can become 30 and take 1 from 8 reducing it to 7.	9 and 8 becomes 17 17 plus 20
54 + 86	50 + 80 + 10 =	Add 6 to 54 to get 60. Then 60 + 80 = 140

Number talks often have a focus strategy such as "making tens" or "compensation." Providing students with a string of related problems, allows students to apply a strategy from a previous problem to subsequent problems. Some units lend themselves well to certain Number Talk topics. For example, the place value unit may coordinate well with the Number Talk strategy of "making ten."

STANDARDS FOR MATHEMATICAL CONTENT

Represent and solve problems involving addition and subtraction.

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

Add and subtract within 20.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

Use place value understanding and properties of operations to add and subtract.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

Work with time and money.

MCC.2.MD.8 Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. *Example: If you have 2 dimes and 3 pennies, how many cents do you have?*

Represent and interpret data

MCC.2.MD.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems[1] using information presented in a bar graph

STANDARDS FOR MATHEMATICAL PRACTICE

This section provides examples of learning experiences for this unit that support the development of the proficiencies described in the Standards for Mathematical Practice. The statements provided offer a few examples of connections between the Standards for Mathematical Practice and the Content Standards of this unit. The list is not exhaustive and will hopefully prompt further reflection and discussion.

1.	**Make sense of problems and persevere in solving them.** Students have multiple opportunities to develop strategies for mental math addition and subtraction as well as solving story problems, riddles, and graphs.
2.	**Reason abstractly and quantitatively.** Students use number lines, base ten blocks, money, and other manipulatives to connect quantities to written symbols. Students compare numbers and discover the communtative property of addition.
3.	**Construct viable arguments and critique the reasoning of others.** Students develop strategies for mental math as well as solving story problems and interpreting graphs. The students share and defend their thinking.
4.	**Model with mathematics.** Students use words,pictures, graphs, money, and manipulatives to express addition and subtraction problems.
5.	**Use appropriate tools strategically.** Students use estimation, pictures, and manipulatives to solve addition and subtraction computation as well as story problems.
6.	**Attend to precision.** Students have daily practice in number talks and tasks to use mathematical language to explain their own reasoning.
7.	**Look for and make use of structure.** Students look for patterns developing mental strategies: making tens, repeated addition, fact families,and doubles.
8.	**Look for and express regularity in repeated reasoning.** Students look for shortcuts in addition mental math: such as rounding up, then adjusting; repeated addition; riddles; and reasonableness of answers.

*****Mathematical Practices 1 and 6 should be evident in EVERY lesson. *****

ENDURING UNDERSTANDINGS

- When one quantity is joined or added on to another quantity, the result is greater than or equal to the initial quantity.
- When one quantity is removed from another quantity, the result is less than or equal to the initial quantity.
- When one quantity is compared to another quantity, the initial quantity is either equal to, greater than, or less than the second quantity.
- Joining, removing, part-part-whole, and comparing problems can be modeled.
- The order of addends may be changed and the result will not change. However this is not true for subtraction.
- The grouping of addends may be changed and the result will not change. However this is not true for subtraction.
- Addends can be decomposed and regrouped differently to simplify adding.
- Addition and subtraction are inverse (opposite) operations.
- Solutions may be solved and checked by using the inverse relation between addition and subtraction of numbers.
- Mental math strategies may be used to solve problems involving numbers.
- Reasonableness of addition and subtraction problems may be determined by using estimation.
- Problems involving numbers may be simplified by using the commutative, associative, and identity properties. (Students are not expected to learn the terms, just the principles.)
- Problems can be solved in a variety of ways such as modeling, counting strategies, or number facts.
- Problems and solutions can use various representations, including concrete objects, pictures, number sentences, and words.
- Various combinations of numbers and operations can be used to represent the same quantity.

ESSENTIAL QUESTIONS

- How do we represent a collection of objects using tens and ones?
- How do I express money amounts?
- When will estimating be helpful to us?
- How can we use skip counting to help us solve problems?
- Can we change the order of numbers if we subtract? Why or why not?
- Can we change the order of numbers when we add (or subtract)? Why or why not?
- How can estimation strategies help us build our addition skills?
- How do we use addition to tell number stories?
- How can benchmark numbers help us add?
- How does using ten as a benchmark number help us add and subtract?
- What strategies can help us when adding and subtracting with regrouping?
- What strategies will help me add multiple numbers quickly and accurately?

- How can we solve addition problems with and without regrouping?
- How can addition help us know we subtracted two numbers correctly?
- How can we solve subtraction problems with and without regrouping?
- How can strategies help us when adding and subtracting with regrouping?
- How can we model and solve subtraction problems with and without regrouping? How can mental math strategies, for example estimation and benchmark numbers, help us when adding and subtracting with regrouping?
- How can I use a number line to help me model how I combine and compare numbers?
- How are addition and subtraction alike and how are they different?
- What is a number sentence and how can I use it to solve word problems?
- How do we solve problems in different ways?
- How can we solve problems mentally? What strategies help us with this?
- How can we show/represent problems in different ways?
- How can problem situations and problem-solving strategies be represented?
- How are problem-solving strategies alike and different?
- How can different combinations of numbers and operations be used to represent the same quantity?

CONCEPTS AND SKILLS TO MAINTAIN

Skills from Grade 1:

It is expected that students will have prior knowledge/experience related to the concepts and skills identified below. It may be necessary to pre-assess in order to determine if time needs to be spent on conceptual activities that help students develop a deeper understanding of these ideas.

- Developing understanding of addition, subtraction, and strategies for addition and subtraction within 20;
- Developing understanding of whole number relationships and place value, including grouping in tens and ones;

Second Grade Year Long Concepts:

- Organizing and graphing data as stated in MCC.MD.10 should be regularly incorporated in activities throughout the year. **Students should be able to draw a picture graph and a bar graph to represent a data set with up to four categories as well as solve simple put-together, take-apart, and compare problems using information presented in a bar graph.**
- Routine topics such as counting, time, money, positional words, patterns, and tallying should be addressed on an ongoing basis throughout instructional time.
- Students will be asked to use estimation and benchmark numbers throughout the year in a variety of mathematical situations.

SELECTED TERMS AND SYMBOLS

The following terms and symbols are not an inclusive list and should not be taught in isolation. Instructors should pay particular attention to them and how their students are able to explain and apply them (**i.e. students should not be told to memorize these terms).**

Teachers should present these concepts to students with models and real life examples. Students should understand the concepts involved and be able to recognize and/or demonstrate them with words, models, pictures, or numbers.

For specific definitions, please reference the Common Core State Standards Glossary.

- **add**
- **addition and subtraction within 5, 10, 20, 100, or 1000**
- **associative property for addition**
- **bar graph**
- **commutative property for addition**
- **comparing**
- **counting strategy**
- **difference**
- **doubles plus one**
- **equations**
- **estimating: fluency**
- **fluently**
- **identity property for addition**
- **join**
- **line plot**
- **picture graph**
- **place value**
- **quantity**
- **recalling facts**
- **re-grouping**
- **remove**
- **scale**
- **strategies for addition**
- **strategy**
- **subtract**
- **unknowns**

STRATEGIES FOR TEACHING AND LEARNING

(Information adapted from North Carolina DPI Instructional Support Tools)

Represent and solve problems involving addition and subtraction.
MCC2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

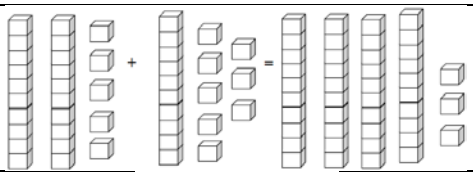
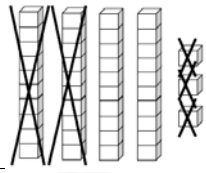
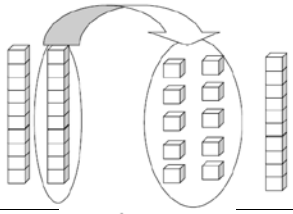
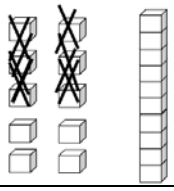
Instructional Strategies

This standard calls for students to add and subtract numbers within 100 in the context of one and two step word problems. Students should have ample experiences working on various types of problems that have unknowns in all positions, including Result Unknown, Change Unknown, and Start Unknown. See Table 1 on page 11 for further examples.

The problems should involve sums and differences less than or equal to 100 using the numbers 0 to 100. It is vital that students develop the habit of checking their answer to a problem to determine if it makes sense for the situation and the questions being asked.

This standard also calls for students to solve one- and two-step problems using drawings, objects and equations. Students can use place value blocks or hundreds charts, or create drawings of place value blocks or number lines to support their work. Examples of one-step problems with unknowns in different places are provided in Table 1. Two step-problems include situations where students have to add and subtract within the same problem.
Example:
In the morning there are 25 students in the cafeteria. 18 more students come in. After a few minutes, some students leave. If there are 14 students still in the cafeteria, how many students left the cafeteria? Write an equation for your problem.

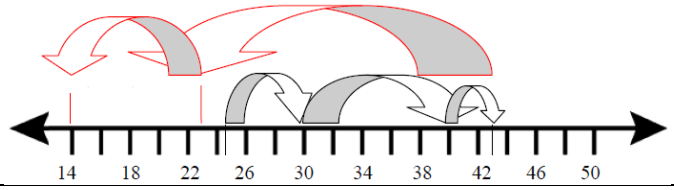
Student 1

Step 1	I used place value blocks and made a group of 25 and a group of 18. When I counted them I had 3 tens and 13 ones which is 43.	
Step 2	I then wanted to remove blocks until there were only 14 left. I removed blocks until there were 20 left.	
Step 3	Since I have two tens I need to trade a ten for 10 ones.	
Step 4	After I traded it, I removed blocks until there were only 14 remaining.	
Step 5	My answer was the number of blocks that I removed. I removed 2 tens and 9 ones. That's 29. My equation is 25 + 18 – ___ = 14.	

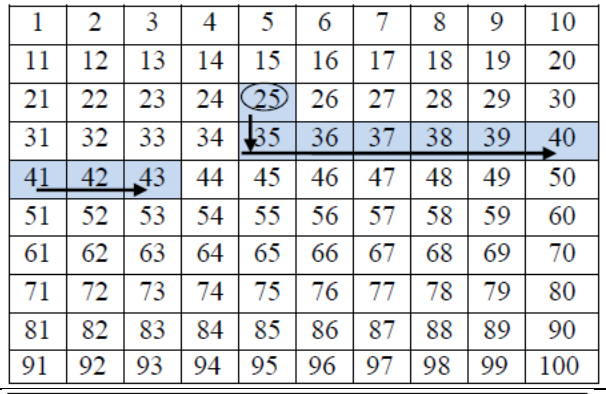
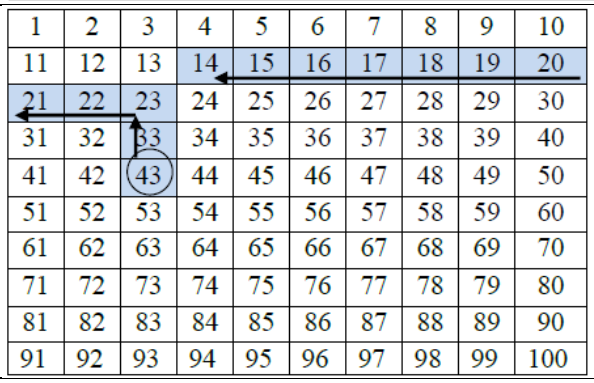
Student 2

I used a number line. I started at 25 and needed to move up 18 spots so I started by moving up 5 spots to 30, and then 10 spots to 40, and then 3 more spots to 43. Then I had to move backwards until I got to 14 so I started by first moving back 20 spots until I got to 23. Then I moved to 14 which were an additional 9 places. I moved back a total of 29 spots. Therefore there were a total of 29 students left in the cafeteria.

My equation is: 25 + 18 – ___ = 14.



Student 3

Step 1	I used a hundreds board. I started at 25. I moved down one row which is 10 more, then moved to the right 8 spots and landed on 43. This represented the 18 more students coming into the cafeteria.	
Step 2	Now starting at 43, I know I have to get to the number 14 which represents the number of students left in the cafeteria so I moved up 2 rows to 23 which is 20 less. Then I moved to the left until I land on 14, which is 9 spaces. I moved back a total of 29 spots. That means 29 students left the cafeteria.	
Step 3	My equation to represent this situation is 25 + 18 – ___ = 14.	

Working on addition and subtraction simultaneously, continually relating the two operations is important for helping students recognize and understand the (inverse) relationship of these two operations. It is also vital that students develop the habit of checking their answer to a problem to determine if it makes sense for the situation and the questions being asked. An excellent way to do this is to ask students to write word problems for their classmates to solve. A good place to start is by giving students the answer to a problem. Then tell students whether you want them to write an addition or subtraction problem situation. Also let them know that the sums and differences can be less than or equal to 100. For example, ask students to write an addition word problem for their classmates to solve which requires adding four two-digit numbers with 100 as the answer. Students then share, discuss and compare their solution strategies after they solve the problems.

The strategies that students use to solve problems provide important information concerning number sense and place value understandings therefore it is important to look at more than answers students get. The strategies students use provide useful information about what problems to give the next day and how to differentiate instruction. Student-created strategies provide reinforcement of place value concepts. ***Teaching traditional algorithms can actually hinder the development of conceptual knowledge of our place value system; whereas student created strategies are built on a student's actual understanding, instead of on what the book says or what we think/hope they know.*** Students make fewer errors with their own invented strategies because they are built on their own understanding rather than memorization.

Table 1: Common addition and subtraction situations

	Result Unknown	**Change Unknown**	**Start Unknown**
Add to	Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? 2 + 3 = ?	Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? 2 + ? = 5	Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? ? + 3 = 5
Take from	Five apples were on the table. I ate two apples. How many apples are on the table now? 5 – 2 = ?	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? 5 – ? = 3	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? ? – 2 = 3
	Total Unknown	**Addend Unknown**	**Both Addends Unknown**
Put Together **Take Apart**	Three red apples and two green apples are on the table. How many apples are on the table? 3 + 2 = ?	Five apples are on the table. Three are red and the rest are green. How many apples are green? 3 + ? = 5, 5 – 3 = ?	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? 5 = 0 + 5, 5 = 5 + 0 5 = 1 + 4, 5 = 4 + 1 5 = 2 + 3, 5 = 3 + 2
	Difference Unknown	**Bigger Unknown**	**Smaller Unknown**
Compare	("How many more?" version): Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy? ("How many fewer?" version): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie? 2 + ? = 5, 5 – 2 = ?	(Version with "more"): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have? (Version with "fewer"): Lucy has 3 fewer apples than Julie. Lucy has two apples. How many apples does Julie have? 2 + 3 = ?, 3 + 2 = ?	(Version with "more"): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have? (Version with "fewer"): Lucy has 3 fewer apples than Julie. Julie has five apples. How many apples does Lucy have? 5 – 3 = ?, ? + 3 = 5

Adapted from Box 2-4 of Mathematics Learning in Early Childhood, National Research Council (2009, pp. 32, 33).

Add and Subtract within 20.
MCC2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

Instructional Strategies
This standard mentions the word *fluently* when students are adding and subtracting numbers within 20. Fluency means accuracy (correct answer), efficiency (within 4-5 seconds), and flexibility (using strategies such as making 10 or breaking apart numbers). Research indicates that teachers' can best support students' memorization of sums and differences through varied experiences making 10, breaking numbers apart and working on mental strategies, rather than repetitive timed tests.

Example: 9 + 5 = ___

Student 1: *Counting On* I started at 9 and then counted 5 more. I landed at 14.	**Student 2: *Decomposing a Number Leading to a Ten*** I know that 9 and 1 is 10, so I broke 5 into 1 and 4. 9 plus 1 is 10. Then I have to add 4 more, which gets me to 14.

Example: 13 – 9 = ___

Student 1: *Using the Relationship between Addition and Subtraction* I know that 9 plus 4 equals 13. So 13 minus 9 equals 4.	**Student 2: *Creating an Easier Problem*** I added 1 to each of the numbers to make the problem 14 minus 10. I know the answer is 4. So 13 minus 9 is also 4.
Student 3: *Using the benchmark of 10* I know that 13 minus 3 equals 10, so I take 3 away from the 9 and 3 away from the 13. 10 minus 6 equals 4.	

Provide many activities that will help students develop a strong understanding of number relationships, addition and subtraction so they can develop, share and use efficient strategies for mental computation. An efficient strategy is one that can be done mentally and quickly. Students gain computational fluency, using efficient and accurate methods for computing, as they come to understand the role and meaning of arithmetic operations in number systems. Efficient mental processes become automatic with use.

Provide activities in which students apply the commutative and associative properties to their mental strategies for sums less or equal to 20 using the numbers 0 to 20.

Have students study how numbers are related to 5 and 10 so they can apply these relationships to their strategies for knowing 5 + 4 or 8 + 3. Students might picture 5 + 4 on a ten-frame to

mentally see 9 as the answer. For remembering 8 + 7, students might think: since 8 is 2 away from 10, take 2 away from 7 to make 10 + 5 = 15. **Activities such as these will provide good opportunities to use "number talks" as described in the 2nd Grade Overview. Example: When presented the problem, 4 + 8 + 6, the student uses number talk to say "I know 6 + 4 = 10, so I can add 4 + 8 + 6 by adding 4 + 6 to make 10 and then add 8 to make 18."** Make anchor charts/posters for student-developed mental strategies for addition and subtraction within 20. Use names for the strategies that make sense to the students and include examples of the strategies. Present a particular strategy along with the specific addition and subtraction facts relevant to the strategy. Have students use objects and drawings to explore how these facts are alike.

Provide simple word problems designed for students to invent and try a particular strategy as they solve it. Have students explain their strategies so that their classmates can understand it. Guide the discussion so that the focus is on the methods that are most useful. Encourage students to try the strategies that were shared so they can eventually adopt efficient strategies that work for them. Use anchor charts/posters illustrating the various student strategies to use as reference as the students develop their toolbox of strategies.

Use place value understanding and properties of operations to add and subtract.

MCC2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

**This standard mentions the word *fluently*, just as stated with MCC2.OA.2, when students are adding and subtracting numbers within 100. Fluency means accuracy (correct answer), efficiency (basic facts computed within 4-5 seconds), and flexibility (using strategies such as making 10 or decomposing).

This standard calls for students to use pictorial representations and/or strategies to find the solution. Students who are struggling may benefit from further work with concrete objects (e.g., place value blocks).

Provide many activities that will help students develop a strong understanding of number relationships, addition and subtraction so they can develop, share and use efficient strategies for mental computation. **An efficient strategy is one that can be done mentally and quickly**. Students gain computational fluency, using efficient and accurate methods for computing, as they come to understand the role and meaning of arithmetic operations in number systems. Efficient mental processes become automatic with use.

Students need to build on their flexible strategies for adding within 100 in Grade 1 to fluently add and subtract within 100, add up to four two-digit numbers, and find sums and differences less than or equal to 1000 using numbers 0 to 1000.

Initially, students apply base-ten concepts and use direct modeling with physical objects or drawings to find different ways to solve problems. They move to inventing strategies that do not

involve physical materials or counting by ones to solve problems. Student-invented strategies likely will be based on place-value concepts, the commutative and associative properties, and the relationship between addition and subtraction. These strategies should be done mentally or with a written record for support.

It is vital that student-invented strategies be shared, explored, recorded and tried by others. Recording the expressions and equations in the strategies horizontally encourages students to think about the numbers and the quantities they represent instead of the digits. Not every student will invent strategies, but all students can and will try strategies they have seen that make sense to them. Different students will prefer different strategies.

Students will decompose and compose tens and hundreds when they develop their own strategies for solving problems where regrouping is necessary. They might use the make-ten strategy (37 + 8 = 40 + 5 = 45, add 3 to 37 then 5) or (62 - 9 = 60 – 7 = 53, take off 2 to get 60, then 7 more) because no ones are exchanged for a ten or a ten for ones.

Have students analyze problems before they solve them. Present a variety of subtraction problems within 1000. Ask students to identify the problems requiring them to decompose the tens or hundreds to find a solution and explain their reasoning.

Example: 67 + 25 = __

Place Value Strategy	**Counting On and Decomposing a Number Leading to Ten**	**Commutative Property**
I broke both 67 and 25 into tens and ones. 6 tens plus 2 tens equals 8 tens. Then I added the ones. 7 ones plus 5 ones equals 12 ones. I then combined my tens and ones. 8 tens plus 12 ones equals 92.	I wanted to start with 67 and then break 25 apart. I started with 67 and counted on to my next ten. 67 plus 3 gets me to 70. Then I added 2 more to get to 72. I then added my 20 and got to 92.	I broke 67 and 25 into tens and ones so I had to add 60 + 7 + 20 + 5. I added 60 and 20 first to get 80. Then I added 7 to get 87. Then I added 5 more. My answer is 92.

Example: 63 – 32 = __

Relationship between Addition and Subtraction
I broke apart both 63 and 32 into tens and ones. I know that 2 plus 1 equals 3, so I have 1 left in the ones place. I know that 3 plus 3 equals 6, so I have a 3 in my tens place. My answer has a 1 in the ones place and 3 in the tens place, so my answer is 31.

Work with Money

MCC2.MD.8 Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. ***Example: If you have 2 dimes and 3 pennies, how many cents do you have?***

- Relate to whole-number place value and base-ten understandings. For example, 23¢ = 2 dimes and 3 pennies.
- Understand the relationship between quantity and value. For example 1 dime = 10¢. Help students to understand that the relationship between coin size and value is inconsistent.
- Limit problems to the use of just dollar and cents symbols. There should be no decimal notation for money at this point.

This standard calls for students to solve word problems involving either dollars or cents. Since students have not been introduced to decimals, problems should either have only dollars or only cents.

Example: What are some possible combinations of coins (pennies, nickels, dimes, and quarters) that equal 37 cents?

Example: What are some possible combinations of dollar bills ($1, $5 and $10) that equal 12 dollars?

The topic of money begins at Grade 2 and builds on the work in other clusters in this and previous grades. Help students learn money concepts and solidify their understanding of other topics by providing activities where students make connections between them. For instance, link the value of a dollar bill as 100 cents to the concept of 100 and counting within 1000. Use play money - nickels, dimes, and dollar bills to skip count by 5s, 10s, and 100s. Reinforce place value concepts with the values of dollar bills, dimes, and pennies. Students use the context of money to find sums and differences less than or equal to 100 using the numbers 0 to 100. They add and subtract to solve one- and two-step word problems involving money situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions. Students use drawings and equations with a symbol for the unknown number to represent the problem. The dollar sign, $, is used for labeling whole-dollar amounts without decimals, such as $29. Students need to learn the relationships between the values of a penny, nickel, dime, quarter and dollar bill.

Represent and Interpret Data

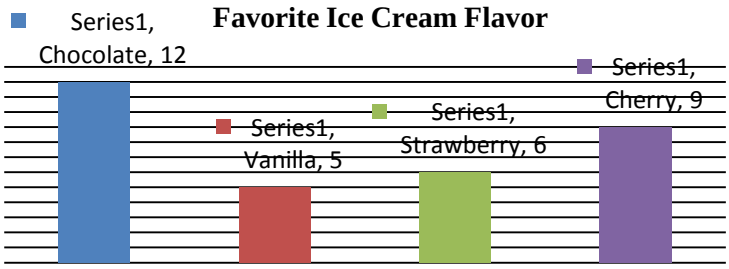
MCC.2.MD.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

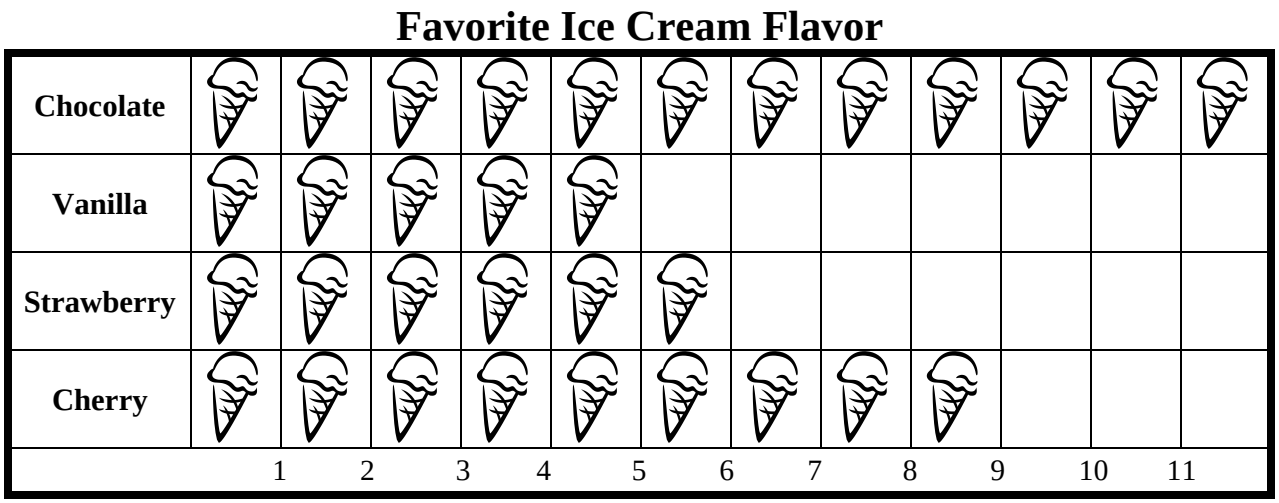
Instructional Strategies

At first students should create real object and picture graphs so each row or bar consists of countable parts. These graphs show items in a category and do not have a numerical scale. For example, a real object graph could show the students' shoes (one shoe per student) lined end to end in horizontal or vertical rows by their color. Students would simply count to find how many shoes are in each row or bar. The graphs should be limited to 2 to 4 rows or bars. Students would then move to making horizontal or vertical bar graphs with two to four categories and a single-unit scale.

Flavor	Number of People
Chocolate	12
Vanilla	5
Strawberry	6
Cherry	9

Students display their data using a picture graph or bar graph using a single unit scale.





As students continue to develop their use of reading and interpreting data, it is highly suggested to incorporate these standards into daily routines. It is not merely the making or filling out of the

graph, but the connections made from the date represented that builds and strengthens mathematical reasoning.

Use the information in the graphs to pose and solve simple put together, take-apart, and compare problems illustrated in Table 1 located on page 12.

COMMON MISCONCEPTIONS

"Children must come to realize that errors provide opportunities for growth as they are uncovered and explained. Trust must be established with an understanding that it is okay to make mistakes. Without this trust, many ideas will never be shared." (Van de Walle, Lovin, Karp, Bay-Williams, Teaching Student-Centered Mathematics, Developmentally Appropriate Instruction for Grades Pre-K-2, 2014, pg. 11)

Some students end their solution to a two-step problem after they complete the first step.They may have misunderstood the question or only focused on finding the first part of theproblem. Students need to check their work to see if their answer makes sense in terms of the problem situation. They need many opportunities to solve a variety of two-step problems and develop the habit of reviewing their solution after they think they have finished.

Many children have misconceptions about the equal sign. Students can misunderstand the use of the equal sign even if they have proficient computational skills. The equal sign means , ―is the same as" however, many primary students think that the equal sign tells you that the ―answer is coming up.‖ Students need to see examples of number sentences with an operation to the right of the equal sign and the answer on the left, so they do not overgeneralize from those limited examples. They might also be predisposed to think of equality in terms of calculating answers rather than as a relation because it is easier for young children to carry out steps to find an answer than to identify relationships among quantities. Students might rely on a key word or phrase in a problem to suggest an operation that will lead to an incorrect solution. They might think that the word *left* always means that subtraction must be used to find a solution. Students need to solve problems where key words are contrary to such thinking. For example, the use of the word *left* does not indicate subtraction as a solution method: Debbie took the 8 stickers he no longer wanted and gave them to Anna. Now Debbie has 11 stickers *left*. How many stickers did Debbie have to begin with?

It is important that students avoid using key words to solve problems. The goal is for students to make sense of the problem and understand what it is asking them to do, rather than search for "tricks" and/or guess at the operation needed to solve the problem.

Students may overgeneralize the idea that answers to addition problems must be greater. Adding 0 to any number results in a sum that is equal to that number. Provide word problems involving 0 and have students model using drawings with an empty space for 0. Students are usually proficient when they focus on a strategy relevant to particular facts. When these facts are mixed with others, students may revert to counting as a strategy and ignore the efficient strategies they learned. Provide a list of facts from two or more strategies and ask students to name a strategy that would work for that fact. Students should be expected to explain

why they chose that strategy then show how to use it.

Students may think that the 4 in 46 represents 4, not 40. Students need many experiences representing two-and three-digit numbers with manipulatives that group (base ten blocks) and those that do NOT group, such as counters, etc.

When adding two-digit numbers, some students might start with the digits in the ones place and record the entire sum. Then they add the digits in the tens place and record this sum. Assess students' understanding of *a ten* and provide more experiences modeling addition with grouped and pregrouped base-ten materials as mentioned above. When subtracting two-digit numbers, students might start with the digits in the ones place and subtract the smaller digit from the greater digit. Then they move to the tens and the hundreds places and subtract the smaller digits from the greater digits. Assess students' understanding of *a ten* and provide more experiences modeling subtraction with grouped and pregrouped base-ten materials.

Students might overgeneralize the value of coins when they count them. They might count them as individual objects. Also some students think that the value of a coin is directly related to its size, so the bigger the coin, the more it is worth. Place pictures of a nickel on the top of five-frames that are filled with pictures of pennies. In like manner, attach pictures of dimes and pennies to ten-frames and pictures of quarters to 5 x 5 grids filled with pennies. Have students use these materials to determine the value of a set of coins in cents.

Sometimes students will record twenty-nine dollars as 29$. Remind them that the dollar sign goes in front. The cent sign goes after the number and there is no decimal point used with the cent sign.

The attributes for the same kind of object can vary. This will cause equal values in an object graph to appear unequal. For example, when making an object graph using shoes for boys and girls, five adjacent boy shoes would likely appear longer than five adjacent girl shoes. To standardize the objects, place the objects on the same-sized construction paper or sticky-note, then make the object graph.

EVIDENCE OF LEARNING

By the conclusion of this unit, students should be able to demonstrate the following competencies:

- Represent and solve problems involving addition and subtraction.
- Solve a variety of word problems involving money using $ and ¢ symbols.
- Understand and apply properties of operations and the relationship between addition and subtraction.
- Recognize how the digits 0-9 are used in our place value system to create numbers and manipulate amounts.
- Understand how addition and subtraction affect quantities and are related to each other.
- Know the multiple meanings for addition (combine, join, and count on) and subtraction (take away, remove, count back, and compare)
- Use the inverse operation to check that they have correctly solved the problem.

- Solve problems using mental math strategies.
- Draw and interpret picture and bar graphs to represent a data set with up to four categories.

TASKS

The following tasks represent the level of depth, rigor, and complexity expected of all second grade students. These tasks or a task of similar depth and rigor should be used to demonstrate evidence of learning. It is important that all elements of a task be addressed throughout the learning process so that students understand what is expected of them.

To assure that this unit is taught with the appropriate emphasis, depth, and rigor, it is important that the tasks be reviewed prior to instruction. The tasks in this unit illustrate the types of learning activities that should be conducted to meet the CCGPS. A variety of additional resources should be utilized to supplement these tasks.

TASK DESCRIPTIONS

Scaffolding Task	Tasks that build up to the learning task.
Constructing Task	Constructing understanding through deep/rich contextualized problem solving tasks.
Practice Task	Tasks that provide students opportunities to practice skills and concepts.
Culminating Task	Designed to require students to use several concepts learned during the unit to answer a new or unique situation. Allows students to give evidence of their own understanding toward the mastery of the standard and requires them to extend their chain of mathematical reasoning.
Formative Assessment Lesson (FAL)	Lessons that support teachers in formative assessment which both reveal and develop students' understanding of key mathematical ideas and applications. These lessons enable teachers and students to monitor in more detail their progress towards the targets of the standards.
***3-Act Task**	A Three-Act Task is a whole-group mathematics task consisting of 3 distinct parts: an engaging and perplexing Act One, an information and solution seeking Act Two, and a solution discussion and solution revealing Act Three. More information along with guidelines for 3-Act Tasks may be found in the ***Guide to Three-Act Tasks*** on georgiastandards.org and the K-5 CCGPS Mathematics Wiki.

TASKS CONTINUED

Task Name	Task Type/Grouping Strategy	Content Addressed	Standard(s)
Look ahead to the FORMATIVE ASSESSMENT (FAL) listed in the table below. You may consider giving the FAL at the beginning of the unit as a pre-assessment. The official administration of the FAL takes place approximately 2/3 of the way through the unit.			
Incredible Equations	Scaffolding Task *Large Group, Small Groups*	Composing and decomposing numbers	MCC.2.OA.2
Order is Important	Scaffolding Task *Large Group*	Using a number line for addition and subtraction	MCC.2OA.2
Different Paths, Same Destination	Constructing Task *Large Group, Partners*	Using a 99 chart	MCC.2.OA.2 MCC.2.NBT.5
Number Destinations	Practice Task *Individual*	Using a 99 chart	MCC.2.OA.1 MCC.2.OA.2 MCC.2.NBT.5
Our Number Riddles/My Number Riddle	Constructing Task *Large group, Partners* Practice Task *Individual*	Using a 99 chart	MCC.2.OA.1 MCC.2.OA.2 MCC.2.NBT.5
Building/Busting Towers of 10	Constructing Task *Partners*	Represent numbers using models, diagrams, and number sentences	MCC.2.OA.1 MCC.2.OA.2 MCC.2.NBT.5
Story Problems	Constructing Task *Individual*	Representing numbers, Addition and Subtraction	MCC.2.OA.1 MCC.2.OA.2 MCC.2.NBT.5 MCC.2.MD.8
Roll Away	Practice Task *Individual*	Estimation, Mental math strategies	MCC.2.OA.2 MCC.2.NBT.5
Mental Math	Constructing Task *Large Group, Small Groups*	Estimation, Mental math strategies	MCC.2.OA.2 MCC.2.NBT.5
Take 100	Practice Task *Large Group*	Addition to 100	MCC.2.OA.2 MCC.2.NBT.5
Multi-digit Addition	Scaffolding Task *Individual*	Multi-digit addition with regrouping	MCC.2.OA.1 MCC.2.OA.2 MCC.2.NBT.5
Addition Strategies	Constructing Task *Large Group, Partners*	Multi-digit addition with regrouping	MCC.2.OA.1 MCC.2.OA.2 MCC.2.NBT.5
Caterpillars and Leaves (FAL)			**MCC.2.OA.1** **MCC.2.OA.2**
Sale Flyer Shopping	Constructing Task *Individual*	Addition with money	MCC.2.OA.1 MCC.2.OA.2 MCC.2.NBT.5 MCC.2.MD.8

TASKS CONTINUED

Grocery Store Math	Practice Task *Large group, Partners*	Modeling addition with money	MCC.2.OA.1 MCC.2.OA.2 MCC.2.NBT.5 MCC.2.MD.8
Subtraction: Modeling w/ regrouping	Scaffolding Task *Large group, Partners*	Multi-digit subtraction with regrouping	MCC.2.OA.1 MCC.2.OA.2 MCC.2.NBT.5
Subtraction Story Problems	Practice Task *Individual*	Multi-digit subtraction with regrouping	MCC.2.OA.1 MCC.2.OA.2 MCC.2.NBT.5
Menu Math	Practice Task *Individual*	Addition and subtraction with money	MCC.2.OA.1 MCC.2.OA.2 MCC.2.NBT.5 MCC.2.MD.8
Counting Mice	Constructing Task *Large Group, Partners*	Multi-digit addition and subtraction	MCC.2.OA.1 MCC.2.OA.2 MCC.2.NBT.5
Every Picture Tells a Story	Practice Task *Individual*	Multi-digit addition and subtraction	MCC.2.OA.1 MCC.2.OA.2 MCC.2.NBT.5
Planning a Field Trip	**Culminating Task** *Individual*	Summative Assessment	MCC.2.OA.1 MCC.2.OA.2 MCC.2.NBT.5 MCC.2.MD.8 MCC.2.MD.10

If you would like further information about this unit, please view the Unit 2 Webinar on the Georgia DOE math wiki.

3 ACT TASK: * Got Milk?

APPROXIMATE TIME: ONE CLASS SESSION
In this lesson, students will use a picture to create a story problem involving addition and/or subtraction.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them. Students are required to figure out a question to work through, the information they need to solve the problem, and then persevere until solving it.
2. Reason abstractly and quantitatively. Students are asked to make an estimate both high and low, as well as plot it on a number line.
3. Construct viable arguments and critique the reasoning of others. Students are given the chance to share and critique the questions and strategies of fellow classmates.
4. Model with mathematics. Students will use the information given to develop a mathematical model to solve their problems.
5. Use appropriate tools strategically. Students can use Base 10 blocks to aid in addition/subtraction strategies.
6. Attend to precision. Students will use clear and precise language when discussing their strategies and sharing their solutions with others.
7. Look for and make use of structure. Students will use their understanding of place value to help them add and subtract two digit numbers.

ESSENTIAL QUESTIONS

- How do we solve problems in different ways?
- How can we show/represent problems in different ways?
- How can different combinations of numbers and operations be used to represent the same quantity?
- How are addition and subtraction alike and how are they different?

MATERIALS

- Cow Picture
- Student Handout

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students will view the picture and tell what they noticed. Next, they will be asked to discuss what they wonder about or are curious about. These questions will be recorded on a class chart or on the board and on the student recording sheet. Students will then use mathematics to answer their own questions. Students will be given information to solve the problem based on need. When they realize they don't have the information they need, and ask for it, it will be given to them.

Background Knowledge:

This task follows the 3-Act Math Task format originally developed by Dan Meyer. More information on this type of task may be found at http://blog.mrmeyer.com/category/3acts/. A Three-Act Task is a whole-group mathematics task consisting of 3 distinct parts: an engaging and perplexing Act One, an information and solution seeking Act Two, and a solution discussion and solution revealing Act Three. More information along with guidelines for 3-Act Tasks may be found in the ***Guide to Three-Act Tasks*** on georgiastandards.org and the K-5 CCGPS Mathematics Wiki.

In this task students will be shown a picture of a herd of cattle and asked what they wonder about. The main purpose of this task is to get students to practice adding or subtracting two digit numbers. Students can approach this in various ways based on the questions they ask. It is imperative that the teacher only provides information that will force a student to use addition or subtraction and not give too much information. Example: If a student's question is, "How many black cows are there?", the student needs to ask how many total cows there are and how many brown cows there are in order to use subtraction to solve the problem. Remember to only give information if it is asked for.

Students should be able to explain and discuss their strategies for answering their main questions to the picture posed in Act 1. They should also be able to picture the story in their minds including the objects and actions in the story. They should solve the problems using pictures, words, and numbers. They should act out the story to make sure pictures, words, and numbers that were used make sense.

COMMON MISCONCEPTIONS

"Children must come to realize that errors provide opportunities for growth as they are uncovered and explained. Trust must be established with an understanding that it is okay to make mistakes. Without this trust, many ideas will never be shared." (Van de Walle, Lovin, Karp, Bay-Williams, Teaching Student-Centered Mathematics, Developmentally Appropriate Instruction for Grades Pre-K-2, 2014, pg. 11)

It is important that students avoid using key words to solve problems. The goal is for students to make sense of the problem and understand what it is asking them to do, rather than search for "tricks" and/or guess at the operation needed to solve the problem.

Task Directions:

Act I – Whole Group - Pose the conflict and introduce students to the scenario by showing Act I picture.

(Dan Meyer http://blog.mrmeyer.com/2011/the-three-acts-of-a-mathematical-story/**)**
"Introduce the central conflict of your story/task clearly, visually, viscerally, using as few words as possible."

1. Show picture of cows to students.
2. Ask students what they noticed in the picture. The teacher records this information.
3. Ask students what they wonder about and what questions they have about what they saw. Students should share with each other first, and then the teacher records these questions (think-pair-share). The teacher may need to guide students so that the questions generated are math-related.
4. Ask students to estimate answers to their questions (think-pair-share). Students will write their best estimate, then write two more estimates – one that is too low and one that is too high so that they establish a range in which the solution should occur.

Anticipated questions students may ask and wish to answer:

- How many cows are there?
- How many cows are brown? *
- How many cows are black? *
- Are there more brown cows or black cows? How many more?*

*Main question(s) to be investigated

Act 2 – Student Exploration - Provide additional information as students work toward solutions to their questions. **(Dan Meyer** http://blog.mrmeyer.com/2011/the-three-acts-of-a-mathematical-story/**)**
"The protagonist/student overcomes obstacles, looks for resources, and develops new tools."

- During Act 2, students use the main question(s) from Act 1 and decide on the facts, tools, and other information needed to answer the question(s). When students decide what they need to solve the problem, they should ask for those things. It is pivotal to the problem solving process that students decide what is needed without being given the information up front. Some groups might need scaffolds to guide them. The teacher should question groups who seem to be moving in the wrong direction or might not know where to begin.

- The teacher provides guidance as needed during this phase. Some groups might need scaffolds to guide them. The teacher should question groups who seem to be moving in the wrong direction or might not know where to begin. Questioning is an effective strategy that can be used, with questions such as:
    - What is the problem you are trying to solve?
    - What do you think affects the situation?
    - Can you explain what you've done so far?
    - What strategies are you using?
    - What assumptions are you making?
    - What tools or models may help you?
    - Why is that true?
    - Does that make sense?

Additional Information for Act 2
- There are 42 cows.
- There are 20 black cows.
- There are 22 brown cows.

Important note: Although students will only investigate the main question(s) for this task, it is important for the teacher to not ignore student generated questions. Additional questions may be answered after they've found a solution to the main question, or as homework or extra projects.

Act 3 – Whole Group – Share solutions and strategies.

- Students to present their solutions and strategies and compare them.
- Reveal the solution.
- Lead discussion to compare these, asking questions such as:
    - How reasonable was your estimate?
    - Which strategy was most efficient?
    - Can you think of another method that might have worked?
    - What might you do differently next time?

Act 4, The Sequel - "The goals of the sequel task are to a) challenge students who finished quickly so b) I can help students who need my help. It can't feel like punishment for good work. It can't seem like drudgery. It has to entice and activate the imagination." Dan Meyer http://blog.mrmeyer.com/2013/teaching-with-three-act-tasks-act-three-sequel/

- Challenge students to answer one of the student generated questions.
- Challenge students to figure out how many ears are on the brown/black cows all together.
- Challenge students to explain what would happen if 6 brown cows left, and 9 black cows joined the herd.

FORMATIVE ASSESSMENT QUESTIONS

- How reasonable was your estimate?
- What might you do differently next time?
- What worked well for you this time?
- What model did you use?
- What organizational strategies did you use?
- Did you group the cows to determine how many there are? If so, how did you group them? Is there a different way you could group them?

DIFFERENTIATION

Extension

- Have students write an addition and a subtraction story problem involving the picture and solve it.
- How many legs are on all the brown cows together? Black cows?

Intervention

- Give students Base 10 blocks or another manipulative to help compute the problem.

Name _____ Date _____

What problem are you trying to figure out?		
What information do you already know?	What information do you need to solve the problem?	
Make an estimate.	Write an estimate that's too low.	Write an estimate that's too high.
Show your estimates on a number line:		
Show your work.		
What is your conclusion? Show the answer using pictures, words, and numbers.		

SCAFFOLDING TASK: Incredible Equations

Approximately 1 Day

In this task, the student will connect quantities with a position on a number line, express numbers in standard, written, and expanded form, write story problems, and generate fact families.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
3. **Construct viable arguments and critique the reasoning of others.**
   Independently written story problems are shared and explained with classmates.
4. **Model with mathematics.**
   Students represent numbers in a variety of ways.
6. **Attend to precision.**

BACKGROUND KNOWLEDGE

This standard calls for students to add and subtract numbers within 100 in the context of one and two step word problems. Students should have ample experiences working on various types of problems that have unknowns in all positions using drawings, objects and equations. Students can use place value blocks or hundreds charts, or create drawings of place value blocks or number lines to support their work.

This task serves as a scaffolding task; however, it could easily become part of your daily or weekly routines. The suggested conversations in this type of task help students develop fluency with numbers by providing them continued experiences with multiple ways of composing and decomposing numbers. These types of experiences and conversations about numbers are also important for further development of the understanding of the magnitude of a given number as well as its relationship to other numbers.

ESSENTIAL QUESTIONS

- How can different combinations of numbers and operations be used to represent the same quantity?
- How are the operations of addition and subtraction alike and different?

MATERIALS

- Paper and pencil (keeping a recording of continued experiences with this type of task could be done in a math journal)

GROUPING

Large group; small group; and/or individual

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I
Select a number to be the number of the day. To begin with you can choose any number between 0-20. This can be done by selecting one randomly from a jar. Other examples of how to come up with the number: use the date, use the number of students present in class that day, the number of students wearing a particular color, the number of students who are eating school lunch, the temperature outside, etc.

Challenge students to represent it in as many ways as possible – place value, word form, expanded notation, addition and subtraction equations; money, etc.
Once students have had 3-5 minutes to write down their ideas have them share their work with a neighbor. Encourage them to notice both similarities and differences in what they did and what their partner did. Ask them to be ready to share one of the ways their neighbor expressed the number that was different from their own.

Then bring the class back together to discuss and share their work.

Ask questions like:
- Where does this number "live" on the number line?
- What numbers live right next door to this number?
- What is 1 more? 1 less? 10 more? 10 less?
- What kind of equations did you write that generated this amount?
- How were the equations different? How were they the same?
- Did you use any kind of strategy for expressing this amount? How was your neighbors work similar to your work? How was it different?
- Do you think this number could be shared equally between 2 people? Why or why not?

Part II
Have students either work with a partner or independently to write a short story problem that matches one of the equations that either they came up with on their own or noticed during pair/share time or one that was shared during the class discussion time.
Have the students read their stories to a partner (or small group or whole class) and have those listening to the problem and identify whether it is an addition or a subtraction problem. Discuss with the students how they decided that the problem was addition or subtraction.

Part III
Select one of the equations the students wrote and have them generate other equations using those same numbers (i.e. creating fact families). Provide an example if students are having difficulty recognizing/remembering the idea of fact family relationships. If this is something that seems foreign to a student, see intervention suggestion below.

COMMON MISCONCEPTIONS:

- When discussing fact family relationships, students may incorrectly order the subtraction equations. Example: student writes 3 + 2 = 5 and 2 + 3 = 5 for addition; but writes 3 – 5 = 2 and 2 – 5 = 3 for subtraction.
- Students do not make connections to inverse operations and revert to use of fingers for subtraction.

FORMATIVE ASSESSMENT QUESTIONS

- Where does this number "live" on the number line?
- What numbers live right next door to this number?
- What is 1 more? 1 less? 10 more? 10 less?
- What kind of equations did you write that generated this amount?
- How were the equations different? How were they the same?
- Did you use any kind of strategy for expressing this amount? How was your neighbors work similar to your work? How was it different?
- Do you think this number could be shared equally between 2 people? Why or why not?

DIFFERENTIATION

Extension
- Introduce the idea of a T-chart and ask students to think about how they could use one to generate multiple equations for a given number.
- Invite students to choose a number, create their own number line, write 2 or 3 questions, and share with classmates.

Intervention
- Allow students to use manipulatives such as connecting cubes, buttons, or chips to make the given amount. Then show them how to separate the items into two different groups and how they can write an equation to represent what they just did. Using those same groupings also discuss with the student how to create a visual of what a fact family looks like. Make sure students can model both addition and subtraction examples with the manipulatives before having them record their work on paper.
- The website http://nlvm.usu.edu/en/nav/frames_asid_156_g_1_t_1.html, gives practice with addition and subtraction. The students may work as a large group or with partners as the number of computers allows. Begin with addition problems, then move to subtraction problems. The students should draw what they think the number lines will look like and

discuss their number lines and their answers. Then have the computer show the correct answer. This could even be used as a game or competition with prizes appropriate for your class. The game could be repeated on multiple days to reinforce this concept. This website requires the use of Java.

SCAFFOLDING TASK: Order is Important

Approximately 2 Days

In this task the student will use manipulatives to model addition and subtraction stories, explore the commutative property of addition, and continue to develop his/her understanding of fact families

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
3. **Construct viable arguments and critique the reasoning of others.**
   Students are asked to prove addition and subtraction solutions as they use manipulatives.
4. **Model with mathematics.**
   Students represent fact families with manipulatives and "Fact Family Houses."
6. **Attend to precision.**
7. **Look for and make use of structure.**
   Students make connections between addition and subtraction through fact families.

BACKGROUND KNOWLEDGE

This task serves as a scaffolding task; however, similar work was done in first grade. You may feel like your students can accomplish all three parts of this task in one day or perhaps you may use this task as an intervention only for those students who are still struggling with basic understanding of addition and subtraction. The suggested conversations in this task are important for further developing the concept of addition and subtraction.

The focus of the task is on the CONCEPT and application of the commutative property…not on the definition or words. Students are also revisiting fact families as well as understating what strategies to use when solving an equation. Students are usually proficient when they focus on a strategy relevant to one particular fact. When these facts are mixed with others (as in a fact family), students may revert to counting as a strategy and ignore the efficient strategies they learned. Provide a list of facts from two or more strategies and ask students to name a strategy that would work for that fact. Students need to explain why they chose that strategy, then show how to use it to solve the equation. Additionally, they need to understand how to attach an equation to a particular story problem.

Be sure to discuss the concept of 0 and what happens when it is added or subtracted from a given amount. Students may over generalize the idea that answers to addition problems must be bigger. Adding 0 to any number results in a sum that is equal to that number. Provide word problems involving 0 and have students model them, using drawings with an empty space for 0.

Special comment- When students are building the towers – make sure they keep the colors snapped together and they do not mix the colors up making a color pattern. Keeping the colors together will allow for them to visually see how numbers can be added and taken away for the connection to fact families. Repeat this task as a class until students are able to answer these questions and explain their reasoning.

ESSENTIAL QUESTIONS

- How do we solve problems in different ways?
- How is addition and subtraction alike and how are they different?
- How are problem-solving strategies alike and different?
- How can problem situations and problem-solving strategies be represented?
- How can different combinations of numbers and operations be used to represent the same quantity?

MATERIALS

- Connecting cubes (Individual bags of 18 cubes – 9 each of 2 different colors)
- Large number line (using masking tape or other materials)
- *Ready, Set, Hop* by Stuart Murphy or similar book

GROUPING

Large group, small group

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I
Gather students in meeting area. Read, *Ready Set Hop,* by Stuart Murphy or a similar book. Encourage students to act out the story using a large number line on the floor. Ask students, "What happens if the frog hops forward? Backwards?" Be aware this may be some student's first experience using a number line to locate and compare numbers.

Teacher models addition and subtraction stories using 2 towers of different colored cubes. Have students build two towers of 9 cubes each – each tower should contain 9 cubes of the same color but the two towers should be two different colors. Call out any addition problem using single digits such as 7+4. Have students build 7+4 using their towers (represent 7 in one color and 4 in a different color). Discuss that the sum of 7+4 is 11. Ask students how they can prove this? (by counting the cubes). What if we wanted to know what 4+7 was? What could we do? Take ideas

from the students…if no one mentions it, ask if they could flip their tower. Would that show 4+7? Yes. What is the sum of 4+7? It is still 1l. Write these problems using a number sentence on the board.

7 + 4 = 11 4 + 7 = 11

Have students model the action of adding these amounts together on the number line.
Make sure to use vocabulary like putting together, combining, adding to, and joining when discussing the action of addition with students.

While students still have the tower built, tell them to look at the 11 they have in front of them and take 4 of one color away – They will see the difference is 7 – write that number sentence on the board 11 – 4 = 7. Say, "We had 11 and removed 4, now what do we have? How do you know?" Then snap the 4 cubes back on the 7 and ask, "What is our total?" Why did it change? Take off 7 to model 11-7. Ask, "How is this different from what we just did?" The difference is 4. Write that on the board.

11 – 4 = 7 11 – 7 = 4

Have students model the action of subtracting these amounts on the number line.
Make sure to use vocabulary like comparing, separating, removing, taking away, and counting back when discussing the action of subtraction with students.

Ask students to look at the numbers on the board and see what all problems have in common. Allow time for discussion. After discussions, test some more numbers to see if this is true with other problems. Use the related terms, facts, and fact family to discuss this concept. Students should recall from previous work in 1st grade that they are creating fact families. See interventions if students are having difficulty with this part of the task.

Make sure to encourage discussion about addition and subtraction being inverse operations (opposite of one another). The action of addition generates a total whereas in the action of subtraction a total is already known.

Part II
Say to students, "Today you will determine if the order of the numbers affects the solution for addition and subtraction." Provide each student with a set of Unifix cubes. Say to students, "Use your cubes to represent the numbers 12 and 3 (12 first then 3)." Allow students time to create towers, then say "Find the sum by linking the cubes and discuss your solution with the class. Watch as your teacher writes a number sentence to represent the sum you found. Now arrange your cubes so that they represent 3 and 12 (3 first then 12). Find the sum by linking the cubes and discuss your solution with the class. Watch as your teacher writes a number sentence to represent the sum you found. Did you get the same result both times? Participate in the class discussion about what happens to the sum of two numbers when you change the order of the numbers. Now, represent the number 12 using the cubes. Remove three of the cubes and discuss your result with the class. Watch as your teacher writes a number sentence to represent the

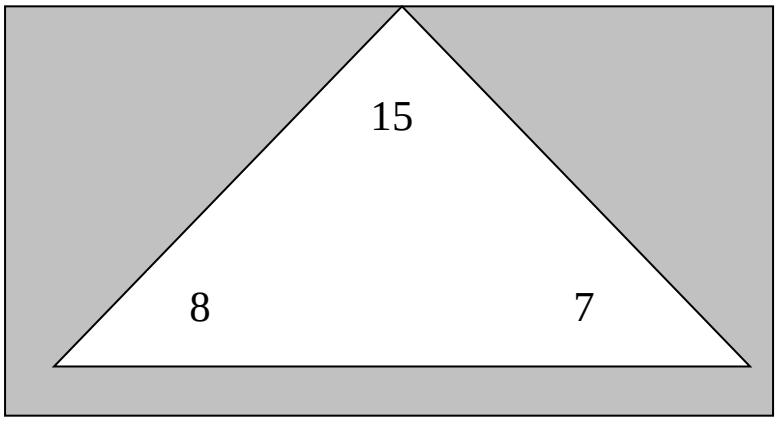
difference you found. Now arrange your cubes so that they represent the number 3. Can you remove 12 cubes? Discuss your answer with the class. Did you get the same result both times?

Participate in the class discussion about what happens to the difference between two numbers when you change the order of the numbers. As in Part I of this task, continue to have discussions with students that encourage them to notice the relationship between addition and subtraction. Invite continued discussion about addition and subtraction being inverse operations (opposite of one another) and talk about the action of addition generates a total whereas in the action of subtraction a total is already known.

Part III

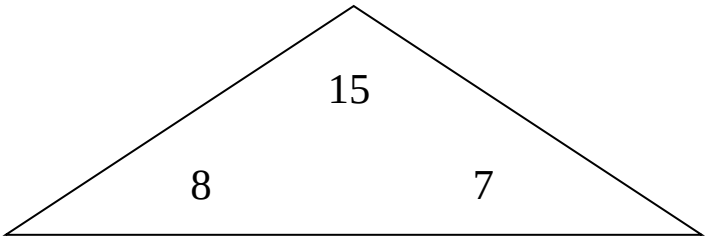
Make a simple pattern of a house (triangle on top of a square) for your students to trace and cut out of construction paper. They may choose whatever color they wish. They will need to have 2 copies that they have traced to serve as the front and back covers of their fact family book. They may design the cover of their book but will need to label it "[Student's name]'s Fact Family House." You may want to cut out white paper in the shape of the house for the pages inside of the book. Each student will need at least 5 white pages for the inside of their book. Have the students choose 4 or 5 numbers between 10 and 18 and write one of the numbers on the top of each "roof." You may wish to demonstrate each of these steps as the children begin so they can see what you are doing. The number the children choose will serve as the largest member of each fact family, and there will be a different fact family on each page of the book.

For example, say you chose 15. You would write 15 at the top of your roof on one of your white pages of paper. In each of the other corners of the roof, you would write a number smaller than 15 so that the two numbers have a sum of 15. If you chose 8, then 7 would be your other number and the roof would look like this.



Next, students will list the addition and subtraction fact family members in the box under the "roof." Then they will use one of the fact family members to write a story problem at the bottom of the page. The reader will have to decide which fact was used to write the story. Students should write the answer on the back of the page. They will continue doing this

with the other numbers they have chosen until they have 4 – 5 pages with a different fact family on each page.



8 + 7 = 15	15 – 8 = 7
7 + 8 = 15	15 – 7 = 8

15 children went swimming in the ocean. 8 children had blue rafts. The rest had red rafts. How many children had red rafts?

Answer: back of the page

FORMATIVE ASSESSMENT QUESTIONS

- What patterns do you see when you create a fact family?
- How is a number affected when we add or take away zero?
- Will changing the order of the numbers in an equation change the result, or answer, to the problem? If not why, if so when?
- How can you represent the same amount using different combinations of numbers?
- In what ways are addition and subtraction similar? In what ways are they different?
- How do you know, or decide, what equation to write to represent a story problem?
- What is another way to solve this problem?

DIFFERENTIATION

Extension

- Use a deck of cards and dominoes to write fact families.

Intervention

- http://illuminations.nctm.org/LessonDetail.aspx?ID=L57

In this lesson, the relationship of subtraction to addition is introduced with a book and with dominoes.

- Provide students with multiple practices using manipulatives (bears, cubes, craft sticks, etc…) to show the relationship between addition and subtraction fact families.

CONSTRUCTING TASK: Different Paths, Same Destination

Approximately 2-3 Days

In this task the student will practice using benchmark numbers as he/she adds and subtracts 1s and 10s using a 99 chart.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
5. **Use appropriate tools strategically.**
   Student use of 99 chart.
6. **Attend to precision.**
7. **Look for and make use of structure.**
   Students look for patterns when adding and subtracting 1s and 10s on the 99 chart.

BACKGROUND KNOWLEDGE

This game will address many different standards and involve listening and problem solving strategies.

Students are usually proficient when they focus on a strategy relevant to particular facts. When these facts are mixed with others, students may revert to counting as a strategy and ignore the efficient strategies they have previously learned. Providing a list (perhaps on chart paper) of facts that includes strategies the students use for solving the facts can be a helpful reference for students. Make sure before posting any strategies that students explain why they chose that particular strategy for that particular fact and have shown show (explain) how to use it.

ESSENTIAL QUESTIONS

- How can different combinations of numbers and operations be used to represent the same quantity?
- How can we use skip counting to help us solve problems?
- How does using ten as a benchmark number help us add or subtract?

MATERIALS

- 99 chart per student
- Class 99 Chart
- Paper/math journals
- Transparent counters or highlighters

GROUPING

Large Group, Partners

NUMBER TALKS

This task will provide a good opportunity to engage students in a number talk about why 10 is used as a benchmark number. For example, ask your students to solve the following equations:

15 + 10 15 + 11 32 + 10 32 + 11 54 + 10 54 + 11

Ask students to share how they used 10 to help them solve the equations quickly.
(For more information, refer to Sherry Parrish, Number Talks, grades K-5.)

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I
This task may provide teachers with the occasion to emphasize and model the importance of good listening skills. Explain to the children they will need to be especially good listeners in order to end up on the correct number.

Gather students in the meeting area. Display the class the 99 chart. Give each student a 99 chart. Select a starting number. Have students place a transparent counter on it or highlight it. Give students directions one at a time using the terms add 10, subtract 10, add 1, subtract 1, 10 more, 10 less, 1 more, and 1 less. After each clue, give students the opportunity to count up using their chart, if they need to and then have students move their transparent counter to the new number. Model this with the class, using only 3 or 4 directions. When the last direction has been given, ask students what number their transparent counter is on.

Sample direction set:

- Place your counter on 16.
- Add 10. (students should move their counter to 26)
- Subtract 1. (students should move their counter to 25)
- Move ahead 10 more. (students should move their counter to 35)
- What number is the counter covering? (35)

Repeat this activity several times as a class making sure to vary directions to include subtracting, moving back 1 or 10, 10 more, 10 less etc. Once students are comfortable with following the given directions, proceed to part II of the task.

Part II
Tell the students the game directions have now changed. Explain to the students that you need their help to create the directions to get to the number 45 from the number 14. Use the large class 99 chart to model the directions offered by students. Ask students to suggest directions. Possible scenario may include "Add 10 to 14." Now where are we? (24) "Add another group of ten." Where are we now? (34) Add 10 once more. (44) We are almost there, what should I add now? (1 more) "Where did we end?" (45)

Students directions will vary, ask students to share. Encourage conversations about the difference in addition strategies presented. It is important to discuss how adding and subtracting 10 is more efficient. This also allows students to practice using 10 as a **benchmark number**. Helping students to see that adding 12 done faster by adding 10 and then 2 more. Working with groups of 10 in this task gives students more practice with understanding benchmarks of 10.

Continue activity with several classroom examples until students appear comfortable with creating directions. Include examples with numbers that have a larger starting point than ending point, so that subtraction is involved.

Allow students to work with a partner to create their own set of directions for a specific number. The teacher will provide the ending point, but will allow students to select their own starting point. For instance, 27 may be the end point the teacher designates. One set of partners may choose to start at 48 and another at 7; however they will all end at 27. Allow time for several partners to share their different pathways to 27. Using their 99 chart and their math journals, have students record their directions to 27. Make comments about various ways to get to the number 27, encouraging students to use benchmark numbers to navigate the numbers.

Part III
Allow students to select any number they choose as their final destination. Then instruct the students to create 3 different paths to the same destination (same number). Also instruct students to include subtraction in at least one of the paths.

FORMATIVE ASSESSMENT QUESTIONS

- What happens to a number when we add ten to it? When we subtract ten from it?
- Are you counting by ones when you add on a ten? Why?
- What does it mean to "skip count" by ten? Why would we want to do this?
- How do you think adding or subtracting by twenty would relate to adding and subtracting by ten?

DIFFERENTIATION

Extension

- Play the "I Have, Who Has?" games. Examples and direction cards are available at http://math.about.com/od/mathlessonplans/ss/ihave.htm These games can be printed on cardstock and laminated for extended use.
- Encourage students to use 2 or more subtractions of 1s or 10s in their paths.

Intervention

- Teacher can select numbers which would allow students to focus on using directions, "I am 1 or 10 less than_____, I am 1 or 10 more than____. What is the number?" This could be done with a sentence frame for students.

Name _____ Date_____

99 Chart

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

PRACTICE TASK: Number Destinations

Approximately 1 Day

In this task the student will develop his/her own number paths using 10 more or 10 less, increasing to 20.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
5. **Use appropriate tools strategically.**
   Student use of 99 chart.
6. **Attend to precision.**
7. **Look for and make use of structure.**
   Students look for patterns when adding and subtracting 1s, 10s, and 20s on the 99 chart.

BACKGROUND KNOWLEDGE

(Information quoted from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades K-3, page 133)

"An important variation of the grouping activities is aimed at the equivalent representations of numbers. For example, with children who have just completed the "Groups of 10" activity for a bag of counters, ask "What is another way you can show your 42 besides 4 groups and 2 singles? Let's see how many ways you can find." Interestingly, most children will go next to 42 singles."

ESSENTIAL QUESTIONS

- How can different combinations of numbers and operations be used to represent the same quantity?
- How can we use skip counting to help us solve problems?
- How does using ten as a benchmark number help us add or subtract?

MATERIALS

- 99 chart (3 per student)
- paper
- "Number Destinations" recording sheet

GROUPING

Individual

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Students work individually to design 3 different number paths using 10 more, 10 less or any of the other directions similar to previous task. For example a student may choose the numbers 29, 48 and 71 and create directions to the three numbers they have chosen. One path must include addition strategies and one path must include subtraction strategies and the last path should be a combination of both addition and subtraction strategies. These should include the use of 10 as a benchmark number. Each number will only be represented by one path. Those students who demonstrated an understanding of the Formative Assessment question addressing the connection between adding/subtracting ten and adding/subtracting twenty to a number in the previous task should be encouraged to include adding or subtracting 20 in one of their paths.

After students have created their 3 Number Destination pages, the teacher may assemble them into a class book to be used as a center.

FORMATIVE ASSESSMENT QUESTIONS

- How did you decide on the directions to write for your path?
- What strategies did you use to determine which number to go to next?
- What happens to a number when we add ten to it? When we subtract ten from it?
- How is adding or subtracting ten from a number different than adding or subtracting one from a number?
- Are you counting by ones when you add on a ten? Why?
- What does it mean to "skip count" by ten? Why would we want to do this?
- How do you think adding or subtracting by twenty would relate to adding and subtracting by ten?

DIFFERENTIATION

Extension

- Create Number Destinations directions that require addition and subtraction for 1 number destination. For example, if the number destination is 74, the student could say, "Begin at 80 and subtract 10 (70) and then add 4 (74).

Intervention

- Teacher selects starting and ending destination. Then allow student to create directions.

Number Destinations

Name ________________________ Date______________

Directions: Design 3 different number paths.

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

CONSTRUCTING TASK: Our Number Riddles

Approximately 3-4 Days

In this task the students will write and solve clues describing numbers.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
   Students persevere in solving number riddles.
5. **Use appropriate tools strategically.**
   Student use of 99 chart.
6. **Attend to precision.**
7. **Look for and make use of structure.**
   Students look for patterns when adding and subtracting using benchmark numbers.

BACKGROUND KNOWLEDGE

Students may revert to counting one by one as a strategy and ignore the efficient strategies they have learned when they are writing and completing/figuring out riddles. Providing a list/chart of facts and strategies your students have come up with for solving different facts is a helpful resource for them to refer to while creating their riddles. It is important in this task to make sure students are explaining why they are selecting the clues for their riddle.

These riddles will address many different standards and involve listening and problem solving strategies. This task builds on work in previous tasks – Different Paths, Same Destination and Number Destinations. Please make sure to review these tasks if you have not already completed them with your students.

When assessing student work, keep in mind that the focus should be on the clues that correctly describe the number. Arrangement of the clues from general to specific is ideal but not expected. This arrangement of clues is ideal, "I am odd. I am a 2-digit number. The sum of my digits is 10. I am one less than 74." However, any arrangement should be accepted as mastery.

ESSENTIAL QUESTIONS

- How can different combinations of numbers and operations be used to represent the same quantity?
- How can we use skip counting to help us solve problems?
- How does using ten as a benchmark number help us add or subtract?

MATERIALS

- 99 chart per partner set for reference
- Sticky notes
- "Number Riddles" student task sheet
- "Make Your Own Number Riddles" student task sheet

GROUPING

Large Group, Partners

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I
Provide a copy of the 99 chart for each student. The teacher thinks of a two-digit number less than 20. (Example – 18). Do not tell the class what it is. Instead, write it on a Post-it note that cannot be seen by the students. Then have students record their guess of what number is written on the post it note. Have students place their sticky note on their palm and come stand in a circle in the meeting area. Begin saying clues about your number, one at a time. "My number is an even 2 digit number." Students who have an even number on their sticky note will raise their hands. Anyone without their hand raised sits down in the circle. The teacher should verify student responses and ask questions if needed. The students with even numbers should remain standing. Continue with the next clue, such as "My number is a 2 digit number." Students who have a two digit number should remain standing and raise their hand. The teacher then verifies their number and others will sit down. The teacher then gives an additional clue, "My number is ten more than 8." If needed, teacher continues with another clue, "My number has an 8 in the ones place." Students who have 8 in the ones place will remain standing and teacher will verify that a student has chosen 18 as their number. **(Again, this is a good opportunity to strengthen listening skills among your students.)**

Continue with various examples to develop student's fluency with this game. As students become more comfortable with the game, provide more challenging clues.

Some other examples of number riddles are:

- My number is even/odd.
- My number is a ___digit number.
- My number is 10 less than _____.
- My number is 10 more than _____.
- My number is 1 less than _____.
- My number is 1 more than _____.
- My number is 5 more than _____.
- My number is 5 less than _____.
- My number is 2 less than_____.
- My number is 2 more than_____.

More challenging examples of clues are:

- If you subtract 3 from my number, you get _____.
- If you start at 0 and count by 5's, you will say my number.
- My number has 2 digits, one is even and one is odd.
- My number is the sum of 10 and 12.
- If you add the digits in my number you get_____.
- If you subtract the digits in my number you get_____.
- My number is 10 more than 40 and ten less than 60.
- I am the value of 6 nickels and 3 pennies.

Part II
Students work with a partner to complete the "Number Riddles" task sheet.

After ample time to complete the task sheet, gather students together and share answers from sheet. Then allow partners to share the riddle they created as part of the task sheet.

Part III
Students work with a partner to complete "Make Your Own Number Riddles" task sheet.

After ample time to complete the task sheet, each set of partners will team up with another set of partners and take turns solving each other's riddle.

Part IV
Special Comment- This part of the task is for individual practice.

Ask the children to work individually to choose a number and write at least 3 clues about the number they chose. The students should write their secret number on the back of their work and the clues on the front.

Once the students have written their clues, select a few students to share his/her clues and see if the class can determine his/her number. The child that correctly determines the number gets to share their clues next. Listen for the use of benchmark numbers such as 10 as students are reading their clues.

FORMATIVE ASSESSMENT QUESTIONS

- How did you decide what clues to write in your riddle?
- Where did you include skip counting in your clues?
- Is there a clue that talked about the money value of your number? If so how did you figure out the amount? How did you count it?
- Did you include a clue about your number being even or odd?
- How do you know if a number is even or odd?

DIFFERENTIATION

Extension

- Challenge students to create numbers riddles for numbers larger than 100.
- Challenge students to use mental strategies to solve the riddles, without the use of the 99 chart.

Intervention

- Limit the numbers students work with to less than 20.
- Provide 99 chart, manipulatives and number line for students.

Name _____ Date_____

Number Riddles

	Clues	Secret Number
1	I am 10 more than 60? What number am I?	
2	I am 1 less than 32. What number am I?	
3	I am the sum of 3 groups of 10. What number am I?	
4	I am an even number. If you have 5 groups of me, you have 10. What number am I?	
5	I am the value of 5 dimes. What number am I?	
6	I am 10 more than 80 and 10 less than 100. What number am I?	
7	I am an odd number. I have 7 tens and 5 ones. You can also discover me by having three quarters. What number am I?	
8	I am the sum of 4 and 5. What number am I?	
9	I am greater than 20. I am less than 22. I am an odd number. What number am I?	
10	Create your own number riddle with your partner.	

Name _____ Date_____

Make Your Own Number Riddles

Clues	Secret Number
I am 10 more than _____? What number am I?	
I am one less than _____. What number am I?	
I am the sum of _____ groups of 10. What number am I?	
I am a/an _____number. If you have _____groups of me, you have _____. What number am I?	
I have _____ tens, and _____ ones. I am a/an _____ number. What number am I?	
I am the value of _____ dimes. What number am I?	
I am 10 more than _____ and 10 less than _____. What number am I?	
I am greater than _____. I am less than _____. I am a/an _____ number.	

CONSTRUCTING TASK: Building Towers of 10

Approximately 2-3 Days

In this task the student will develop addition and subtraction skills as he/she works within 100 to build and break down towers of 10 in a game using dice.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
   Students are challenged with building and busting 10s.
4. **Model with mathematics.**
   Students build and bust numbers using unifix cubes and number cubes.
6. **Attend to precision.**

BACKGROUND KNOWLEDGE

This task is focused on students counting collections of objects in sets of ten and using their understanding of place value to record larger amounts. At first students will build up to 100, They need a dozen or so experiences playing the Building version (addition) **BEFORE** doing the Busting version (subtraction).This is not intended to introduce the strategy of regrouping to students. These games are designed to give students the opportunity to experience the “action” of addition and the “action” of subtraction and how these two actions are opposite (inverse) operations. As established in Unit 1, in this task the students are building a true foundation for their number knowledge by decomposing and composing groups ten.

ESSENTIAL QUESTIONS

- How does using 10 as a benchmark number help us add or subtract?
- How do we represent a collection of objects using tens and ones?

MATERIALS

- Unifix cubes-100 per partner set (or you could use base ten blocks)
- 2 number cubes (One labeled 1-6, another labeled 4-9) for each pair of students
- Place Value Mat
- Paper

GROUPING

Partners

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Task Directions for Building (Addition Version)-
Students work with a partner and play the "Building to 100" game. Students take turns tossing both number cubes and adding the numbers on each cube. Then the player who rolled the number cubes collects that many objects. Students should use their place value mats to manipulate the number. This amount is added to the existing collection of cubes in towers of 10. Together partners determine their new total and record this number on a sheet of paper. Before each toss, the player must tell the total number of cubes, counting by 10s and 1s. Partners continue rolling and collecting objects until they create a collection of 100 cubes – ten towers of 10.

Task Directions for Busting (Subtraction Version)-
Students work with a partner and play the "Busting100" game. Have students play backwards from 100 to 0. Students begin with ten groups of 10 cubes and break apart the groups to remove the sum of the dice they rolled. This time the mat begins with ten towers of ten already on it. Using connecting cubes is suggested so that students can unsnap (bust) the towers as needed. Students take turns tossing both number cubes and adding the numbers on each cube. Then the player who rolled the number cubes takes that many off of the mat. Students should use their place value mats to represent the number. This amount is taken away from the existing collection of cubes in towers of 10 and ones that are on the mat. Together partners determine their new total and record this number on a sheet of paper. Before each toss, the player must tell the total number of cubes, counting by 10s and 1s. Partners continue rolling and taking off cubes until they have reached zero cubes.

FORMATIVE ASSESSMENT QUESTIONS

- What did you do to figure out how many blocks to add/subtract each time?
- What strategies were you using to add/subtract the numbers on the dice?
- How did you know your total was correct or not each time?
- Show me 74 on your mat. How is that amount different from 47? How is it the same?

DIFFERENTIATION

Extension

- Have students work beyond 100, up to two hundred recording the amounts. Encourage students to try and write an equation expressing what they are doing on each turn/roll.
- Have students use a 100's chart instead of manipulatives. Students would have to state what number they currently have and how far they have until they reach their "goal"

Intervention

- Have students build collections to 50 and use 2 (1-6) number cubes.

For students having difficulty with the subtraction part of the task use the version of the game located at this NCTM website where they begin with 20 instead of 100.
http://illuminations.nctm.org/LessonDetail.aspx?ID=L43

Hundreds	Tens	Ones

CONSTRUCTING TASK: Story Problems

Approximately 1 Day

In this task the student will solve and verify story problems using coins as repeated addition, as well as strategies learned in previous tasks.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

MCC.2.MD.8 Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. *Example: If you have 2 dimes and 3 pennies, how many cents do you have?*

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
3. **Construct viable arguments and critique the reasoning of others.**
   Students will defend the strategies they used to solve the word problems.
5. **Use appropriate tools strategically.**
   Students are making choices about the tools (drawing pictures, manipulatives) used to solve word problems.
6. **Attend to precision.**
8. **Look for and express regularity in repeated reasoning.**
   Students make connections between adding coins, skip counting, and mental math.

BACKGROUND KNOWLEDGE

Students should be able to discuss how to solve the word problems. They should also be able to think about what is happening in a story and picture the story in their minds including the objects and actions in the story.

The following questions would be used to guide their thinking prior to this task:

- What happened first? What happened next?
- What does each amount in the story represent?
- How could we draw a picture to show what is going on in the story?

They should solve the problems using pictures, words, and numbers. They should act out the story to make sure pictures, words, and numbers that were used make sense.

ESSENTIAL QUESTIONS

- How do we solve problems in different ways?
- How can we show/represent problems in different ways?
- How can different combinations of numbers and operations be used to represent the same quantity?
- How is addition and subtraction alike and how are they different?
- How does using ten as a benchmark number help us add and subtract?

MATERIALS

- A large selection of manipulatives
- Paper
- "Story Problems" student task sheet

GROUPING

Individual

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Comments
Students are completing each of the problems in this task individually. In order to be successful in the task, students should have had multiple experiences solving problems involving addition and subtraction. This standard calls for students to add and subtract numbers within 100 in the context of one and two step word problems. Students should have ample experiences working on various types of problems that have unknowns in all positions using drawings, objects and equations. Students can use place value blocks or number charts, or create drawings of place value blocks or number lines to support their work.

(Information quoted from Van de Walle and Lovin, Teaching Student-Centered Mathematics, Grades K-3, pg. 150 & 151)
"The recognition of coins is not a mathematical skill at all. The names of our coins are conventions of our social system. Students learn these names the same way that they learn the names of any physical objects in their daily environment – through exposure and repetition…

There is nothing wrong with asking second-grade students to do the mental math required in counting a collection of coins. Even though it is actually mental computation, the numbers are fortunately restricted to multiples of 5 and 10 with some ones added at the end.

Part I
Have a brief discussion with the class where you do a few example problems such as:

Niko has 1 dime, 2 nickels, and 4 pennies in his pocket. How much money does Niko have in his pocket?

Jake had 41 stickers in his book, 14 in his desk, and 26 under his bed. Sara has 50 stickers total. Who has more stickers? How many more do they have?

Kiesha earned 5 dimes for cleaning her room. How much money did Kiesha earn?

Present "Story Problems" task sheet and allow students to complete individually. Students can solve the problems any way they choose using any manipulatives and tools they need. Remind students to record their solutions with pictures, words, **and** numbers. Students then share their solutions and strategies with partners. Encourage partners to look for similarities and differences in their solutions and discuss them.

FORMATIVE ASSESSMENT QUESTIONS

- What strategies did you use to solve the problems?
- Did you try to solve the problem more than one way?
- How did you determine which way, (equation, picture, words) to represent the number?
- Did you use skip counting to help you solve any of the problems? If so which ones and how?
- How do you determine if an amount can be shared equally? Why should it be shared equally?

DIFFERENTIATION

Extension
- Have students show two strategies and explain their thinking to solve each problem.

Intervention
- Provide a 99 chart or number line to help with skip-counting.
- Provide coin manipulatives.

Name _____ Date_____

Story Problems

1. Mrs. Evans has 3 dimes in her purse. Then she found 1 nickel and 2 pennies in her coat pocket. Does she have more in her purse or coat pocket? How do you know? Show your work.

2. Ling lives on a farm with 10 horses, 43 cows, 4 dogs and 1 cat. How many animals live on Ling's farm? Show your work.

3. Create a story problem of your own, using items you have in your classroom. Solve your story problem using pictures and words.

PRACTICE TASK: Roll Away

Approximately 1 Day

In this task students will practice estimation skills in a game using dice.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

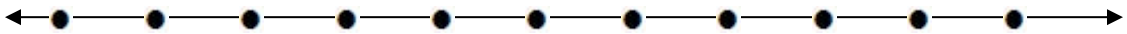
1. **Make sense of problems and persevere in solving them.**
3. **Construct viable arguments and critique the reasoning of others.**
   Students justify their estimations.
6. **Attend to precision.**
7. **Look for and make use of structure.**
   Students use mental math to determine nearest multiple of ten and add the two-digit multiples of ten.

BACKGROUND KNOWLEDGE

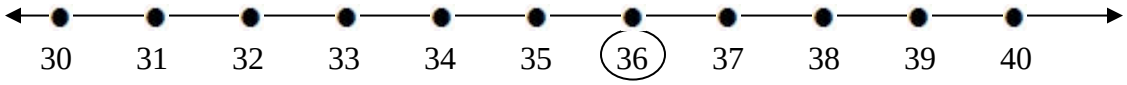
Students should be proficient in determining to which multiple of ten any given two-digit number is nearest. They should also be comfortable adding two-digit multiples of ten (For example, 20 + 60 = 80).

This task is designed to provide addition practice and mental math/estimation skills. You may want to use a book like, *Mental Math in the Primary Grades*, by Jack Hope, R. Reys, Larry Leutizinger, Barbara Reys, and Robert Reys to practice mental math with the class as a whole group.

Use all available opportunities during the day to incorporate the use of estimation, for example, determining to which multiple of ten a given number is nearest. This skill was originally introduced in Grade 1, supported with the use of a number line 0-99 chart and/or a hundreds chart. Students should have these tools available for this task. Alternatively, students can create a number line to determine the closest multiple of ten. A student sheet with open number lines could be provided. An example of an open number line is shown below.



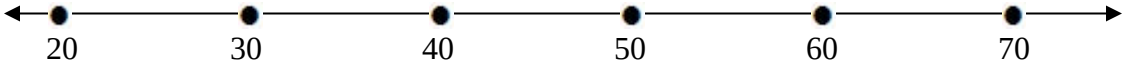
For the number 36, students can fill in the numbers around 36, including the two closest multiples of ten as shown below. Then looking at the number line, students can determine the multiple of ten that is the closest to 36. In this case 40 is 4 away, but 30 is 6 away, so 40 is the closest multiple of ten.



For the number 63, students can follow the same procedure to determine the multiple of ten that is the closest to 63. In this case 60 is 3 away, but 70 is 7 away, so 60 is the closest multiple of ten.

Estimating skills will help students determine reasonableness of answers, a vital skill for everyday living.

Once students are comfortable using a number line with every number marked, transition them to a number line that has benchmarks of 5 or 10 marked. This allows students to build on their prior knowledge of the number. When students become successful with a benchmark number line, move onto an open number line where students mark the numbers that will be useful for them.



If you incorporate daily math routines into your instruction, many opportunities present themselves for activities with estimation. Also, be sure students make connections between counting by tens, multiplying by ten, and estimating to the nearest ten before adding or multiplying.

ESSENTIAL QUESTIONS

- What is an effective way to estimate numbers?
- How can estimation strategies help us build our addition skills?
- When will estimating be helpful to us?
- How can benchmark numbers help us add?

MATERIALS

- Two six-sided dice
- "Roll Away Game" recording sheet

GROUPING

Partners

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students play a game with dice that enables them to build mental math concepts as they practice addition skills and strategies and determine to which multiple of ten a given number is nearest.

Task Directions
Gather students in the meeting area and model with the students how to play "Shake, Rattle, and Roll." Provide each pair with a recording sheet and allow students time to complete the task.

This is a two player game that will help you practice your estimation skills. The goal of the game is to be the person with the most points at the end of 8 turns.

1. Play with a partner. You will need 2 dice and a recording sheet for each player.
2. Roll two dice. Form the two possible numbers as shown below.

   Example: 

   Using the digits 3 and 6, make the numbers 36 and 63. Find the nearest multiple of 10 for each number, and then using mental math, add to find an estimate.
   Estimated sum = 40 + 60 = 100
3. Player one records the estimate on the game recording sheet to end round 1. Your partner must agree with your estimation.
4. Player two takes a turn, following steps 2 and 3 above.
5. Players take turns for a total of ten rounds.
6. After each of the ten rounds, each player finds the sum of their estimates. At the end of the game the player with the highest sum overall wins the game. The players do not have to find the sum of all ten rounds, they need to find their highest round and compare it with their partner's highest round.

FORMATIVE ASSESSMENT QUESTIONS

- Explain how you found the closest multiple of ten.
- Do you think your estimated sum is higher or lower than the actual sum? Why? How could you check?
- What kinds of situations in life might be easier if you knew how to estimate and add numbers like this?

DIFFERENTIATION

Extension

- Increase the amount of dice to 3.

Intervention

- Use number lines, 99's charts, and models to help students who are having difficulty determining to which multiple of ten their number is nearest. Use counting up/counting back to the nearest multiple of ten and compare the results to determine to which multiple of ten, a number is closest.

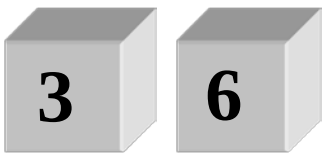
"Shake, Rattle, and Roll"
Game Directions

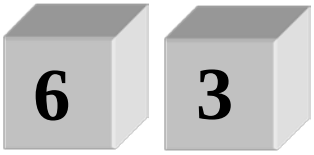
This is a two player game that will help you practice your estimation skills. The goal of the game is to be the person with the most points at the end of ten turns.

Directions:

1. Play with a partner. You will need 2 dice and a recording sheet for each player.
2. Player one rolls two dice and forms the two possible numbers as shown below.

Example:





Using the digits 3 and 6, make the numbers 36 and 63. Find the nearest multiple of 10 for each number, and then using mental math, add to find an estimate.

Estimated sum = 40 + 60 = 100

3. Player one records the estimate on the game recording sheet to end round 1. Your partner must agree with your estimation, using a calculator to check if needed.
4. Player two takes a turn, following steps 2 and 3 above.
5. Players take turns for a total of six rounds.
6. After six rounds, each player finds the sum of their estimates. Players do not have to find the sum of all six rounds, they need to find their highest round and compare it with their partner's highest round to determine the winner.

"Shake, Rattle, and Roll Recording Sheet"

Player 1 _____

Round	Dice Numbers		Smaller Number		Larger Number		Add to find the Estimated Sum
	Die 1	Die 2	Actual	Nearest Multiple of 10	Actual	Nearest Multiple of 10	
1							
2							
3							
4							
5							
6							
						Total	

"Shake, Rattle, and Roll Recording Sheet"

Player 2 _____

Round	Dice Numbers		Smaller Number		Larger Number		Add to find the Estimated Sum
	Die 1	Die 2	Actual	Nearest Multiple of 10	Actual	Nearest Multiple of 10	
1							
2							
3							
4							
5							
6							
						Total	

CONSTRUCTING TASK: Mental Mathematics

Approximately 1-2 Days

In this task the students will develop mental math strategies using number talks.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
   Students make connections between the numeral and its quantity on the number line.
3. **Construct viable arguments and critique the reasoning of others.**
   Students solve and share mental math strategies.
6. **Attend to precision.**

BACKGROUND KNOWLEDGE

Students should have some prior experiences with basic computation strategies allowing them to calculate quickly and reliably. Examples include counting on, doubling, making tens, and using benchmark numbers.

Students should be encouraged to solve problems in ways that make sense to them and explain their process. If students have never been encouraged to solve problems mentally and share their own strategies with others, they may be reluctant to share or may feel that their strategy is inappropriate. Establish ground rules in your classroom about sharing ideas and how to appropriately respond to each other.

Discussions should move beyond whether or not the answers are correct. The goal here is to develop efficient ways to group numbers and/or develop compensation strategies for mental addition and subtraction. The value of group discussions and modeling is evident when students gather insights from their classmates that will reinforce basic number sense and develop strategies that will help them become better at mental computation.

ESSENTIAL QUESTIONS

- What is mental math?
- How does mental math help us calculate more quickly?
- How can mental math strategies, for example estimation and benchmark numbers, help us when adding and subtracting with regrouping?

MATERIALS

- Chalkboard, overhead projector, or Interactive whiteboard
- "Mental Mathematics" recording sheet

GROUPING

Large group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Begin this activity by placing one problem at a time on the board, preferably horizontally. Be aware that students may initially need individual time to solve these problems mentally, so encourage students to be patient and quiet during this time.

After allowing enough time for students to consider the problem, lead a discussion by asking several students to share their solution and/or strategy. **Simply stating an answer is not enough to make this a rich activity.** Encourage students to share different strategies, asking them to try to make sense of each solution as it is presented. Remind students that the goal is to become **efficient** and **flexible** in their thinking and strategies. This is a good opportunity to remind students how a number line can be beneficial to keep track of their action. Using a model such as a number line allows students to become more aware of what is happening as they transition to a larger number or a smaller number, rather than just teaching the students the algorithm which may not make sense to them at this early stage of developing understanding. **Teaching traditional algorithms can actually hinder the development of conceptual knowledge of our place value system; whereas student created strategies are built on a student's actual understanding.**

Have students follow the directions below:
Solve the following problems as they are placed on the board using no paper or manipulatives. Use your mental math strategies. Be prepared to share your solutions and strategies.

Problem	Possible Strategies
15 + 7	• 15 + 5 is 20 and 2 more is 22.
	• 5 + 7 is 12 and 10 more is 22.
	• 10 + 7 is 17, 3 more is 20 and 2 more is 22.

Problem	Possible Strategies
24 + 16	• 20 + 10 is 30 and 4 + 6 is 10, so 30 + 10 is 40.
	• 4 + 6 is 10 and 20 + 10 is 30, so 10 + 30 is 40.
	• 24 + 6 is 30 and 10 more is 40.

Problem	Possible Strategies
50 - 12	• 50 – 10 is 40, then 40 – 2 is 38.
	• 50 – 2 is 48, them 48 – 10 is 38.
	• You need 8 more to get to 20 from 12, then 30 more to get to 50, so the answer is 8 + 30 or 38.

Note: Students who use this method are actually finding the *difference* between the two numbers and not simply "taking away." This is an opportunity to discuss different subtraction approaches.

Problem	• Possible Strategies
99 + 17	• 99 and 1 more is 100, 100 + 17 is 117, but take 1 away that was added to the 99 to get 100, so the answer is 116.
	• Some may attempt a traditional algorithm, but should notice that this is more cumbersome that examining the numbers and using the ideas above to compute.

Note: Teaching traditional algorithms can actually hinder the development of conceptual knowledge of our place value system; whereas student created strategies are built on a student's actual understanding.

FORMATIVE ASSESSMENT QUESTIONS

- What is one strategy you could use to solve the problem quickly?
- How can you verify your solution?
- Could this problem be solved another way? How?
- Which problem solving strategy works best for you?
- What does mental math mean to you?

DIFFERENTIATION

Extension.

- Have students develop their own mental math problems, solve them, and explain their solution strategies.

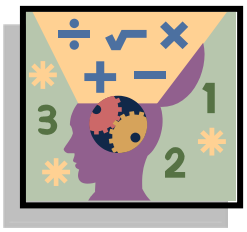
Intervention

- Have students work with smaller, single-digit or numbers less than 20 initially.
- Have students work with a partner to develop strategies.

Students who struggle with math reasoning often have difficulty communicating their thinking. Extra sensitivity and encouragement must be shown for these students as they develop and strengthen these sets of process skills. Questioning can scaffold students who are challenged by discussing their math thinking.

Name _____ Date_____

Mental Mathematics



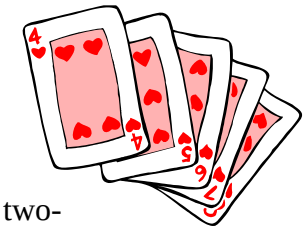
When your teacher gives you an addition problem, solve it using mental mathematics and then explain your thinking in the correct box below. During student sharing, if you like a strategy used by another student, record it in the same box.

Problem #1	**Problem #2**
Problem #3	**Problem # 4**

Name _____ Date_____

99 Chart

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99



PRACTICE TASK: Take 100

Approximately 1 Day

In this task the student will develop mental math strategies in a game adding 2 two-digit number cards to 100.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
4. **Model with mathematics.**
   Students use number cards to make combinations to 100.
6. **Attend to precision.**
7. **Look for and make use of structure.**
   Students look for patterns in numbers to mentally add combinations to 100.

BACKGROUND KNOWLEDGE

Students should have some prior experiences with basic computation strategies allowing them to calculate quickly and reliably. Examples include counting on, doubling, making tens, and using benchmark numbers.

Students should have had practice developing strategies to make combinations of one hundred easily using mental math. If you feel like your students need further practice with mental math strategies be sure to attend to the ideas and suggestion in the previous task Mental Mathematics.

ESSENTIAL QUESTIONS

- How can we solve problems mentally?
- What strategies will help me add multiple numbers quickly and accurately?
- How can mental math strategies help us add?

MATERIALS

- A deck of cards containing **two** of each of the following numbers: 10, 20, 30, 40, 50, 60, 70, 80, 90, 50, 5, 95, 15, 85, 25, 75, 35, 65, 45, 55. (Copy 2 game cards sheets for each deck of cards)
- "Take Ten Game" Student Recording Sheet

GROUPING

Partners

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Gather students in the meeting area to model the "Take 100" game. Use the think-aloud strategy to model ways students can think about pairs to 100. Then allow time for students to complete the game in pairs. They should select only 2 cards that total 100.

Players place a shuffled deck of cards (see attached cards) between them. Player 1 turns over the top card and lays it to one side of the deck so that the number shows.

Player 2 turns the next card, laying it to the other side of the overturned deck so that the numbers are showing. If the 2 cards total one hundred, the first student to say "one hundred!" gets those two cards. If the cards do not total 100, each player turns over another card placing it beside the cards turned over previously. This allows students to choose 2 cards that total 100 from a set of numbers. Both players look to see if a sum of 100 can be made. The first player to find a pair of cards that totals 100 and says "one hundred!", gets the two cards. Play continues until all the cards have been used.

As students play, ask them to record their pairs of 100 as an addition number sentence. This gives students an opportunity to focus on the pairs that make 100 and provides a record of the game.

This game can be adapted to eliminate the speed aspect to the game. Students can take turns turning over two cards and placing them face up next to the deck of cards. If the sum of the numbers is 100, the student gets to take those cards and any others that have been turned over. If the numbers do not equal 100, then the cards are left face up and the student's turn ends. Play continues until all of the cards have been turned over. The player with the most cards at the end of the game wins.

After ample time playing the game bring students back together to discuss what they were thinking about while playing the game.

FORMATIVE ASSESSMENT QUESTIONS

- What do you do to help you remember the number combinations that make up one hundred? Are you thinking of number combinations that make ten? How does this help?
- What can you do to find the answer quicker than your partner?
- Why doesn't 63 + 47 equal 100?

DIFFERENTIATION

Extension

- Have students create number cards using numbers that are not multiples of 5.
- To determine a winner have each student take all the cards he or she won and add them. Students will trade cards and let their partner add the cards with a calculator. When the amounts agree, the student with the larger total wins the game.

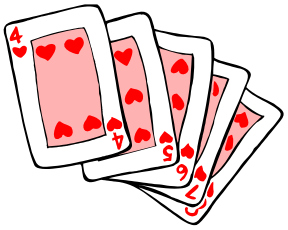
Intervention

- Play a "Pairs to Twenty Game" using two of each of the following cards: 1, 19, 2, 18, 3, 17, 4, 16, 5, 15, 6, 14, 7, 13, 8, 12, 9, 11, 10, 10. Once students become proficient to 20, increase to 50.

5	10	15	20
25	30	35	40
45	50	55	60

65	70	75	80
85	90	95	50

Take 100 Game



Number of Players: 2

Materials: Deck of 40 Cards

Directions:

1. Shuffle the cards well and lay them face down in a pile on the desk.
2. Turn the top card over and set it to the side where both partners can see it. Now turn the next card over and set it to the side of the first overturned card.
3. Your goal in this game is to make sets of one hundred.
4. If the first two overturned cards equal one hundred when added together, try to be the first one to say, "One hundred!" loudly enough for your partner to hear you. If you are first to notice, you may take the cards. If your partner is the first to notice, he or she gets to take the cards.
5. If the first two cards do not make a set of one hundred, keep turning cards over and setting them next to the first overturned cards. When someone spots a combination of one hundred, they can take the two cards that total 100. Keep playing this way until all cards have been claimed or until no cards are left and the overturned cards do not make a set of one hundred.
6. The player with the most cards at the end of the game is the winner.

SCAFFOLDING TASK: Multi-digit Addition Strategies

Approximately 3 Days

In this task the students will use mental math strategies and/or manipulatives to solve two digit addition story problems.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
   Students realize doing math involves solving problems and discussing how problems were solved.
3. **Construct viable arguments and critique the reasoning of others.**
   Students share strategies and solutions to the problems.
6. **Attend to precision.**
   Students develop their mathematically communication skills as they share their strategies.

BACKGROUND KNOWLEDGE

Students should have had prior experiences and/or instruction with addition and subtraction of two-digit numbers without regrouping. Students should also have experience solving various story problems with the use of manipulatives. Students can use place value blocks, number charts, create drawings of place value blocks, or number lines to support their work.

Some students may draw a picture, solve the problem with manipulatives, or use benchmark numbers. All of these strategies demonstrate a solid foundation of number sense. If you notice students using the traditional algorithm for regrouping, it is imperative that you ask them to explain their reasoning for using this method. The idea that numbers can be “carried” is not a natural progression when numbers are combined. Algorithms are a short cut method that makes recording numbers more convenient and efficient.

Students need to explore many different strategies for combining numbers before they can understand the idea of an amount being "carried" from one place value position to another. Moving to the standard algorithm too early will often prevent students from continuing to make sense of the numbers that work within a given situation.

ESSENTIAL QUESTIONS

- How can we solve addition problems with and without regrouping?
- Can we change the order of numbers when we add (or subtract)? Why or why not?
- How can we solve problems mentally?
- How can strategies help us when adding and subtracting with regrouping?

MATERIALS

- Various manipulatives (counters, base-ten blocks, unifix cubes)
- Chart paper for class recording sheets

GROUPING

Large group, small group

NUMBER TALK

This task will lend itself to numerous opportunities for students to engage in meaningful number talks.
(For more information, refer to Sherry Parrish, Number Talks, grades K-5.)

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I
Introduce task with this story problem:

Mrs. Brown and Mrs. White are going to join their classes together for a popsicle party. Mrs. Brown has 18 students in her class and Mrs. White has 19 students in her class. They plan on getting one popsicle for each student in their classes. How many popsicles do Mrs. Brown and Mrs. White need to buy?

Have several students retell the story problem to you and discuss what is happening in the problem to ensure their understanding.

Part II
Split students into pairs and give each student a half sheet of chart paper to use in solving the problem. Also, have various manipulatives available for students to use as they work to solve the problem. Walk around and observe students as they are problem solving.

Ask questions such as:

- What are you trying to find out?
- How many students are in Mrs. Brown's class?
- How many students are in Mrs. White's class?
- Can you explain the strategies you are you using to solve this problem?
- Are there other ways you could solve the problem?
- Is there a way you can check your answer?

As you are walking around, find students who are using a variety of strategies.

Part III

Let several students share their different strategies and answers to the problems. Allow the students to call on their peers to ask questions or make comments about their strategy and the answer that was found. After students have shared various strategies, spend some additional time discussing the different strategies students have used. Some students may have broken the numbers into smaller pieces to simplify the addition problem.

- For example, in 18 + 19 you can begin by pulling out the tens and add 10 +10 = 20. You then have 8 + 9. You can then break up the 9 into 7 and 2. Next, add 8 + 2 to get 10. You will then have 7 more to add. 10 +10 +10 +7 = 37.
- Other students may have used benchmark numbers to help add. For example 18 + 19 could have been solved by keeping the 18 and taking 2 from 19. You can have 20 and 17. You can then add 20 + 17 to get 37.
- Another Strategy may be to add 1 to 19 to make a group of 20 then add 17 to 20 by grouping 10 more, equally 30 then add 7.
- Creating groups of 10 with the numbers to 20 is another strategy. Adding 1 to 19 and 2 to 18 to make them both 20. Then adding 20 and 20 to get 40 then taking off the 3 (from the 1 and 2) to get 37.

This may sound convoluted to adults, but students who have strong number sense will tend to think in this way. When we teach **just** the algorithm we discourage the students from using a more natural strategy. When they are allowed to develop strategies that make sense to them then they are developing better number sense of addition… and subtraction! Create a list with students of the various strategies they can use when solving addition problems. Some students may have also mentioned the traditional algorithm for addition with regrouping. As long as they can explain **what** they are doing and **why** it works then it is okay to include this as a strategy. It is more beneficial to encourage students to utilize the various other strategies at this time; then move towards the algorithm when they can demonstrate true number sense.

Comments

If no student describes using the number line or number chart as a strategy, then this is a good time to bring up this tool for combining amounts. Students should be able to use the number line or number chart as a tool for adding numbers. For example, students could find 18 on the number line or number chart and count on 19 or vice versa. Use of models in this way elicits a natural discussion about the commutative property of addition.

Part IV
Give students this problem:
Max had an ant collection with 38 ants. His friend Lily had an ant collection with 24 ants. If they combine their ants, how many ants did the two friends have?

Allow students to attempt to solve this problem on their own. As students work, walk around asking questions about the students' strategy use. Look to see if students are using the strategies mentioned above.

After students have completed solving the problem, allow students to take turns sharing their strategy with people at their table or other small groups of students. The task should be closed with the teacher selecting students to highlight various strategies used in the classroom and again referring to the number line or number chart if it is not one of the strategies presented by students.

FORMATIVE ASSESSMENT QUESTIONS

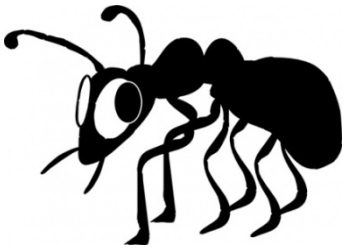
- Describe how you solved the problem.
- Do you think you could solve the problem another way?
- How is your strategy for solving the problem the same as your neighbor's? How is it different?
- How do you think we should record our work so that someone else could understand what we did?

DIFFERENTIATION

Extension
- Give students this problem to supplement problem 1: If popsicles come in boxes of 10, how many boxes do Mrs. Parkerson and Mrs. Young need to get for their classes of 24 students? If each student gets one popsicle, how many popsicles will be left over?
- Give students this problem to supplement problem 2: If Max and Lily join their ants together in Lily's ant farm, and the ant farm can hold up to 100 ants, will there be enough room for both Max and Lily's ants? How do you know? How many more ants could Max and Lily place into the ant farm before it reaches its maximum capacity?
- Write a problem involving either the ants or the popsicles, and ask a partner to solve it. What strategy was used?

Intervention
- Some students may need to work on the second problem with partner groups. They may not be ready to utilize the addition strategies independently in this lesson. They may also need to use manipulatives to physically act out the problem.
- Some students may not be able to communicate their strategy in written form. Those students could be pulled and solve the second problem individually in an interview type setting, so they could explain their process as they go.

Name: _____ Date: _____



Max had an ant collection with 38 ants. His friend Lily had an ant collection with 24 ants. If they combine their ants, how many ants did the two friends have? Explain your thinking with numbers, pictures, and words.

CONSTRUCTING TASK: Addition Strategies

Approximately 2-3 Days

In this task the student will use mental math strategies and/or manipulatives to solve two-digit addition story problems.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
3. **Construct viable arguments and critique the reasoning of others.**
   Students explain and defend their strategies.
4. **Model with mathematics.**
   Students represent numbers in a variety of ways.
6. **Attend to precision.**

BACKGROUND KNOWLEDGE

(Information quoted from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades K-3, pages 169)

"The traditional computational methods for addition and subtraction are significantly different from nearly every invented method. In addition to starting with the rightmost digits and being digit oriented (as already noted), the traditional approach involved the concept generally referred to as *regrouping* (a very strange term), exchanging 10 in one place-value position for 1 in the position to the left ("carrying")- or the reverse, exchanging 1 for 10 in the position to the right ("borrowing"). The terms *borrowing* and *carrying* are obsolete and conceptually misleading. The word *regroup* also offers no conceptual help to young children. **A preferable term is *trade*.** Ten ones are *traded* for a ten. A hundred is *traded* for 10 tens.

Terminology aside, the trading process is quite different from the bridging process used in all invented and mental strategies. Consider the task of adding 28 + 65. Using the traditional method, we must first add 8 and 5. The resulting 13 ones must be separated into 3 ones and 1 ten. The newly formed ten must then be combined with the other tens. This process of "carrying a ten" is conceptually difficult and is different from the bridging process that occurs in invented strategies. In fact, nearly all major textbooks now teach this process of regrouping prior to and separate from direct instruction with the addition and subtraction algorithm, an indication of the difficulties involved. The process is even more difficult for subtraction, especially across a zero in the tens place where two successive trades are required."

ESSENTIAL QUESTIONS

- How can we solve addition problems with and without regrouping?
- What is a number sentence and how can I use it to solve word problems?
- How do we use addition to tell number stories?

MATERIALS

- Base Ten Blocks (Hundreds, Tens, and Ones)
- Place Value Mat
- "Addition Strategies Problems" task sheet

GROUPING

Large group

NUMBER TALK

As in the previous task, this task will lend itself to numerous meaningful number talk opportunities. It is important for teacher to encourage students to use precise mathematical language when communicating the strategies used to solve math problems.
(For more information, refer to Sherry Parrish, Number Talks, grades K-5.)

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I
Give students this problem:
Lucy has 28 green candies and 46 blue candies. How many candies does she have?

Allow the children to utilize various strategies discussed in earlier task. Have their base ten blocks, place value mats, as well as number lines and number charts available to help them find the answer to the problem.

While students are working, circulate and ask these kinds of questions:

- What are you trying to find out?
- How many red candies does Lucy have?
- How many blue candies does Lucy have?
- Are you using a picture, number, or words to organize your thinking?
- How is this problem similar to problems we solved before?
- Can you explain the strategies you are you using to solve this problem?
- Could you use a different strategy to combine these amounts?
- Does it matter which number you begin with?
- Is there a way you can check your answer?

If students are using the place value map and blocks, these are questions you may ask:

- Does it matter which number you begin with?
- How many ones do you need in the ones place to begin with? How did you figure that out? Which digit did you look at? What is its value in that place?
- How many tens do you need in the tens place to begin with? How did you figure that out? Which digit did you look at? What is its value in that place?
- What did you notice about the ones? What will you have to do with some of your ones? Can you trade them in any way?
- How many tens do you have now? Why did it change? How did you figure that out? Which digit did you look at? What is its value in that place?
- Is there a way you can check your answer?

After students have solved the problem, pull the class together for a class discussion. Allow several students to demonstrate their strategy.

Part II
Give students the Addition Strategies Problems sheet to solve in partner groups. Have base ten blocks, place value mats, number lines or number charts available for student use.

While students are working, circulate and question students:

- What are you trying to find out?
- How can you use base-ten blocks to help you solve this problem?
- How many ones do you need in the ones place to begin with? How did you figure that out? Which digit did you look at? What is its value in that place?
- How many tens do you need in the tens place to begin with? How did you figure that out? Which digit did you look at? What is its value in that place?
- What did you notice about the ones? What will you have to do with some of your ones? Can you regroup them in any way?
- How many tens do you have now? Why did it change? How did you figure that out? Which digit did you look at? What is its value in that place?
- Can you explain the strategies you are you using to solve this problem?
- How can you solve this problem using a number sentence?
- Is there a way you can check your answer?

Part III
After students have completed the problems, allow them to take turns sharing the strategy they used for each problem. Allow other classmates to make comments on the strategies and/or ask questions.

FORMATIVE ASSESSMENT QUESTIONS

- What are you trying to find out?
- How can you use base-ten blocks to help you solve this problem?
- How many ones do you need in the ones place to begin with? How did you figure that out? Which digit did you look at? What is its value in that place?
- How many tens do you need in the tens place to begin with? How did you figure that out? Which digit did you look at? What is its value in that place?
- What did you notice about the ones? What will you have to do with some of your ones? Can you regroup them in any way?
- How many tens do you have now? Why did it change? How did you figure that out? Which digit did you look at? What is its value in that place?
- Can you explain the strategies you are you using to solve this problem?
- How can you solve this problem using a number sentence?
- Is there a way you can check your answer?

DIFFERENTIATION

Extension
- Allow students to make up their own three-digit addition story problems. They can solve their own problems or trade with a partner. Provide students with number cubes/base ten blocks to create their own problems.

Intervention
- Some students may need additional support during the problem solving through additional questioning and scaffolding.
- Use pennies, dimes, and dollars to help with the understanding of regrouping and still have the same amount.

Name _____ Date_____

Addition Strategies Problems

1. Jody and Jose are playing basketball. Jody makes 25 shots in a row and Jose makes 37 shots in a row. How many shots did Jody and Jody make altogether?

2. It rained 14 inches last month and 18 inches this month in Seattle. How many inches of rain has Seattle had in the past two months?

3. Ellen has 46 baseball cards. She buys another pack with 12 baseball cards. How many baseball cards does she have in all?

At this point in the unit you should administer the Formative Assessment Lesson *Caterpillars and Leaves*. This should be given approximately 2/3 of the way through the unit to guide and inform your instruction.

Formative Assessments Lessons (FALs)
What is a Formative Assessment Lesson (FAL)? The Formative Assessment Lesson is designed to be part of an instructional unit typically implemented approximately two-thirds of the way through the instructional unit. The results of the tasks should then be used to **inform** the instruction that will take place for the remainder of the unit.
Formative Assessment Lessons are intended to support teachers in formative assessment. They both reveal and develop students' understanding of key mathematical ideas and applications. These lessons enable teachers and students to monitor in more detail their progress towards the targets of the standards. They assess students' understanding of important concepts and problem solving performance, and help teachers and their students to work effectively together to move each student's mathematical reasoning forward.

What does a Formative Assessment Lesson look like in action? Videos of Georgia Teachers implementing FALs can be accessed HERE and a sample of a FAL lesson may be seen HERE.

****This FAL may have been used in 1st grade. It is appropriate to use it again at a more rigorous level for 2nd graders.**

CONSTRUCTING TASK: Sale Flyer Shopping

Approximately 1 Day

In this task the student will add prices of purchases and use the cent symbol correctly.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

MCC.2.MD.8 Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. *Example: If you have 2 dimes and 3 pennies, how many cents do you have?*

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
4. **Model with mathematics.**
   Students represent addition with coins.
6. **Attend to precision.**
8. **Look for and express regularity in repeated reasoning.**
   Students look for patterns and shortcuts when adding coins or using the cent symbol.

BACKGROUND KNOWLEDGE

(Information quoted from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades K-3, pages 152)

Students should have had prior experiences and/or instruction with addition and subtraction of two-digit numbers with and without regrouping (but not requiring the traditional computational algorithm of trading). Students should also have had experience working with money amounts.

"Remember that working with coins requires not only adding up the values but also first mentally giving each coin value and then ordering the coins. Be sure to value any approach that works. However, pay special attention to those students who begin with the larger values and

those who put nice combinations together utilizing thinking with tens. There is no reason to require students to add in any particular order, not with this activity or with coins."

The purpose of this task is to further develop students' understanding of the concept of addition while making the connection to money using only coin amounts.

ESSENTIAL QUESTIONS

- How can we solve addition problems with and without regrouping?

MATERIALS

- "Shopping Flyer" student sheet
- "Shopping Flyer" student task sheet

GROUPING

Individual

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Task Directions
Show students a sale flyer with various toys. Explain to the students that they are to choose two items that they would like to buy. They will determine the total cost of the two items.

Give each student a shopping recording sheet. Have students choose two items with their prices from the sale flyers for each shopping page. Have them glue these on the page. Instruct students to find the total price of the two items by modeling each amount and finding the total. Students should use the ¢ symbol to represent the prices and total. Once students finish solving the problem, encourage them to write a word problem for each page of their shopping book. Students will complete the task by drawing coins to show the total amount. Engage students in a discussion about why they chose to use the coins they did to represent the total amount.

After students have created several pages for their shopping books, allow a few students to share their problems and strategies with the class. Allow other students to make questions and comments about the work.

Variations to task:
You could create a class book and designate certain totals for different chapters. See how many different combinations the class can come up with for generating the given amount. You can also vary the amounts on the toys to increase/decrease particular totals that you want the students to generate. In addition, you may choose to use actual store flyers or ads. Make sure you select only items with cent symbols.

FORMATIVE ASSESSMENT QUESTIONS

- How is adding money amounts like adding amounts that aren't represented as money?
- What strategies did you use for combining the money amounts?
- What did you do to check your work?
- Did anyone else create the same amount you did but use different toys? Why did this happen?

DIFFERENTIATION

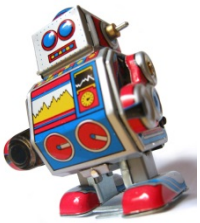
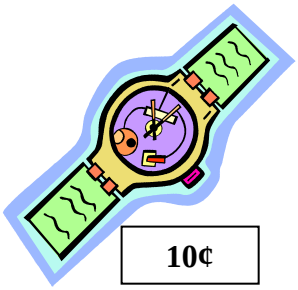
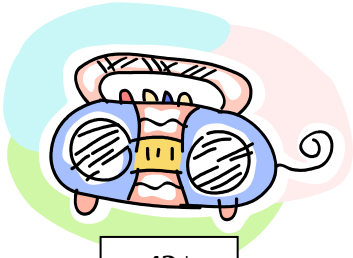
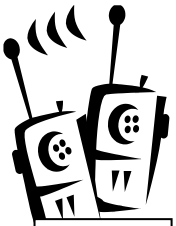
Extension

- Have students purchase more than two items and find the total.
- You may also allow students to attempt to total the sum of all pages in their shopping book to see how much they have spent altogether.

Intervention

- Provide plastic coins or coin photocopies for students to use to find the total of their purchase.
- For students having difficulty with adding the two items, encourage them to use a 99's chart or money number line.

_____'s Cool Stuff
Store Shopping Flyer for the Week of
_____

 45¢	 25¢	 12¢
 19¢	 30¢	 15¢
 22¢	 10¢	 42¢
 38¢	 8¢	 41¢

Name _____ Date _____

Items I Bought: (glue pictures and prices here)
Addition Strategy:
Addition Problem: _____ ¢ + _____ ¢ = _____¢
Word problem:
Draw coins to show your total amount.

PRACTICE TASK: Grocery Store Math

Approximately 1 Day

In this task the student will add dollar amounts of purchases using the $ symbol correctly.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

MCC.2.MD.8 Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. *Example: If you have 2 dimes and 3 pennies, how many cents do you have?*

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
4. **Model with mathematics.**
   Students represent addition with bills.
6. **Attend to precision.**
8. **Look for and express regularity in repeated reasoning.**
   Students look for patterns and shortcuts when adding bills or using the dollar symbol.

BACKGROUND KNOWLEDGE

Students should have had prior experiences and/or instruction with addition and subtraction of two-digit numbers with and without regrouping. Students should also have had experience working with money amounts.

The purpose of this task is to further develop students' understanding of the concept of addition with money. This task builds on the concepts that were addressed in the previous task Sale Flyer Shopping. Additionally, reinforces the connection between addition to subtraction.

ESSENTIAL QUESTIONS

- How can we model and solve addition problems with and without regrouping?

MATERIALS

- *Lemonade for Sale* by Stuart Murphy or similar book
- Bag containing 5-7 grocery items

GROUPING

Partners, small groups

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Gather students together on the meeting area. Read *Lemonade for Sale* by Stuart J. Murphy or similar book. Discuss scenario from story. Then show students your bag of groceries. The bag should contain 5-7 items, which could include an empty box of cereal, empty carton of juice or milk, bag of peanuts, can of soup, etc. You want to include items that cost between $1.00 and $10.00. Keep the amounts in whole dollar quantities.

Create an interactive story about your last visit to the grocery store such as "I went to the grocery store to buy a box of cereal for $3 and a can of soup for $1. How much did I spend?" Talk about how adding dollar amounts is just like adding ones, fives, and tens. Allow time for students to practice drawing the dollar sign symbol. If none of the students notice that it looks like a capital S with two lines through it ask them 'What letter does this symbol look like?".

Next tell the students that you went to the store with a $10 bill to buy these two items. Have them figure out how much money you left the store with after buying the two items.

Discuss how to solve the problem and find out how much money was spent to purchase the items. Continue grocery store shopping by having another pair of students select two items to purchase. Share the items and prices with the class and allow all students to find the total amount of money spent. Also ask how much was left from a particular total that you tell them. Keep it a decade number (i.e. $10, $20, $30 etc.). Have the two "shoppers" present their model and solution to the class and discuss the strategies used. Repeat this process with additional pairs of students to allow all students to have an opportunity to shop, solve, and share their purchases with the class.

FORMATIVE ASSESSMENT QUESTIONS

- What addition strategy did you use to determine the total cost?
- What strategy did you use to figure out the remaining money from a total starting amount?

- How are you modeling/showing and checking your work?
- How is this like working with numbers that aren't money amounts?

DIFFERENTIATION

Extension

- Have students choose more than two items.
- Have students create their own grocery store story problem and solve.

Intervention

- Use prices that do not require much regrouping.
- Provide fake bills for students to use to find the total of their purchase.

SCAFFOLDING TASK: Subtraction: Modeling with Regrouping

Approximately 4-5 Days

In this task the students will develop an algorithm for regrouping/trading in subtraction problems

STANDARDS FOR MATHEMATICAL CONTENT

MCC2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
3. **Construct viable arguments and critique the reasoning of others.**
   Students are explaining and defending their strategies to regroup/trade.
4. **Model with mathematics.**
   Students represent and use base ten blocks to solve subtraction problems.
6. **Attend to precision.**
   Students are using precise mathematical language to explain their strategies.

BACKGROUND KNOWLEDGE

Students should have had prior experiences and/or instruction with addition and subtraction of two-digit numbers without regrouping. Students should also have experience regrouping using base-ten blocks.

Success with this task relies on student understandings of collections of objects in sets of ten as well as their understanding of how this relates to place value. Students need to have had multiple experiences playing both the **Building 100 and Busting 100** games mentioned previously in this Unit. Those two games were not intended to introduce the strategy of regrouping to students. They were designed to give students the opportunity to experience the "action" of addition and the "action" of subtraction and how these two actions are opposite (inverse) operations. If students have had **MANY** opportunities to play and discuss those two games **THEN** they should be ready for further discussion of subtraction and what the concepts of "regrouping" and "trading" mean.

ESSENTIAL QUESTIONS

- How can we model and solve subtraction problems with and without regrouping?
- Can we change the order of numbers we subtract? Why or why not?
- How can we solve problems mentally? What strategies help us with this?
- How can mental math strategies, for example estimation and benchmark numbers, help us when adding and subtracting with regrouping?

MATERIALS

- Bags of Base Ten Blocks (at least 8 hundreds, 20 tens, and 10 ones per pair of students)
- Place Value Mat
- "Subtraction with Regrouping" student task sheet

GROUPING

Large group, partners

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I
Give student pairs a copy of a place value board and a plastic bag with 2 hundreds blocks, 20 ten blocks, and 20 ones. **Have students play the game "Bust One Hundred" again from previous task in this Unit to review regrouping skills and prepare for subtraction with regrouping.**

For increased understanding, it is suggested that teachers first model the task while students follow along with their own materials:

- Begin with a 100 block on the place value mat.
- Roll the dice. Pose the question "How can I subtract ____ ones from a 100 block?" Prior experience with the "Busting 100" game should lead students to the understanding that they will need to "bust" the hundred block into 10 tens blocks (regrouping/trading) and then "bust" one of the ten blocks into 10 ones (regrouping/trading) before they can begin subtracting. Demonstrate for students how to regroup/trade a hundred for 10 tens and a ten for 10 ones in order to subtract.

Have students begin working with a hundred block on their place value mats. Each partner takes a turn rolling the dice. The student has to take away the number of ones that matches their roll. Allow students to play until they reach zero ones. While students are playing, walk around and ask questions like:

- How many (hundreds, tens, ones) do you have? What digits would be in those places? What is their value?
- How will you regroup/trade your hundreds for tens?
- What is your new number? What digit would be in the hundreds place now? What is its value? How do you know?
- What is happening to your number? Why?

- How will you regroup/trade your tens for ones? What digit would now be in the tens place? What would be the value of that digit? How about the ones place?
- Which place would have the largest digit in it right now? Does it also have the greatest value? How do you know?

Repeating this activity using a number line or 100 chart will help to connect the model of the hundreds block with the understanding of the magnitude.

Part II
Once students have played for a while, present them with this problem:
Julie has 53 math problems to complete for homework. She has already finished 38 of the problems. How many more math problems does she need to solve?
Ask questions such as:

- What are you trying to find out?
- How many problems did Julie have to solve for homework?
- How many problems has Julie already solved?
- What number do you need to represent on your place value mat first? Why?
- How many will you take away/remove? Why?
- What did you notice about the ones? What will you have to do in order to subtract? Can you regroup them in any way? How will this help?
- How many tens do you have now? What digit is now in the tens place? What is the value of that digit?
- How many ones do you have now? What digit is now in the ones place? What is the value of that digit?
- Can you explain the strategies you are using to solve this problem?
- Is there a way you can check your answer?

After students have solved the problem, pull the class together for a class discussion. Allow several students to demonstrate their processes using the white board or the overhead projector.

Note: Some students may begin using the traditional algorithm as a strategy. This is often introduced by families as a way to help their child add and subtract at home. **Moving to the standard algorithm too early will often prevent students from continuing to make sense of the numbers that work within a given situation. Make sure the students can use precise mathematical language (ones place, tens place, hundreds place, trade, regroup, etc.) when explaining what is going on when performing the algorithm.**

Part III
Give students the "Subtraction: Modeling with Regrouping/Trading" student task sheet to solve with partners using base-ten blocks and the regrouping algorithm. While students are working, circulate and question students:

- What are you trying to find out?
- What number do you need to represent on your place value mat first? Why?
- How many will you take away/remove? Why?

- What did you notice about the ones? What will you have to do in order to subtract? Can you regroup them in any way? How will this help?
- How many tens do you have now? What digit is now in the tens place? What is the value of that digit?
- How many ones do you have now? What digit is now in the ones place? What is the value of that digit?
- Can you explain the strategies you are you using to solve this problem?
- Is there a way you can check your answer?

Part IV
After students have completed solving the problems, allow students to take turns sharing the strategy they used to solve each problem. Allow other classmates to make observations and ask questions.

Parts V-VII of the task should be completed the following day.

Part V
Gather students in the class meeting area and present students with this story problem:

Mr. Lundquist has a very large family. One evening he brought home 36 potatoes for his family of sixteen children, his wife, and himself. Each person had a potato for dinner that evening. How many potatoes are left?

Have several students retell the story problem and discuss what is happening in the problem.

Part VI
Split students into pairs and give each student a half sheet of chart paper to use in solving the problem. Also, have various manipulatives available for students to use as they work to solve the problem. Walk around and observe students as they are problem solving.
Ask questions such as:

- What are you trying to find out?
- How many potatoes did Mr. Lundquist have at the beginning of the story?
- How many potatoes did his family eat? How do you know?
- Can you explain the strategies you are using to solve this problem?
- Are there other ways you can solve this problem?
- Is there a way you can check your answer?

As you are walking around, find students who are using a variety of strategies. Some students may draw a picture, solve the problem with manipulatives, use benchmark numbers, or use the traditional algorithm for subtraction with regrouping.

Let several students share their different strategies and answers to the problems.
Allow the students to call on their peers to ask questions or make comments about their strategy, and the answer that was found. After students have shared various strategies, **spend some**

additional time discussing the use of benchmark numbers. Demonstrate for students how the problem could have been solved by breaking the larger numbers into number combinations that are easier to subtract. For example with 36-18, you can take 2 from 36 and give it to 18 to change the problem to 34-20. You can then subtract 30-20 to get 10 and 4-0 to get 4. The difference would be 14. Create a list with students of various strategies students can use when solving subtraction problems.

FORMATIVE ASSESSMENT QUESTIONS

Refer to questions in each of the sections I-VI

DIFFERENTIATION

Extension

- Allow students to attempt regrouping problems with three-digits.
- Allow students to make up their own three digit subtraction story problems. They can solve their own problems or trade with a partner.

Intervention

- Some students may need additional support during the problem solving through additional questioning and scaffolding. Having them work with a partner who is very articulate about their mathematical thinking will also help.

Hundreds	Tens	Ones

Name: _____ Date_____

Subtraction with Regrouping/Trading Problems

1. Moby, the dog, buried 62 bones in the backyard. His friend, KJ, dug up 28 of the bones. How many of Moby's bones are still buried in the backyard?

2. Kino's class is reading a chapter book with 196 pages. They have already read 57 pages. How many more pages does Kino's class have to read in order to finish the book?

3. Emily began collecting stickers when she was five. She now has 76 stickers. She decided to give her little sister Madelyn 58 of her stickers. Now how many stickers does Emily have?

PRACTICE TASK: Subtraction Story Problems

Approximately 1 Day

In this task the student will independently solve subtraction story problems and defend his/her answers and strategies.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
3. **Construct viable arguments and critique the reasoning of others.**
   Students are explaining and defending their strategies to regroup/trade.
4. **Model with mathematics.**
   Students represent and use base ten blocks to solve subtraction problems.
6. **Attend to precision.**
   Students are using precise mathematical language to explain their strategies.

BACKGROUND KNOWLEDGE

Students should have had prior experiences and/or instruction with addition and subtraction of two digit numbers without regrouping. Students should also have experience solving various story problems with the use of manipulatives.

(Information quoted from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades K-3, pages 169)

"The traditional computational methods for addition and subtraction are significantly different from nearly every invented method. In addition to starting with the rightmost digits and being digit oriented (as already noted), the traditional approached involve the concept generally referred to as *regrouping* (a very strange term), exchanging 10 in one place-value position for 1

in the position to the left ("carrying")- or the reverse, exchanging 1 for 10 in the position to the right ("borrowing"). The terms *borrowing* and *carrying* are obsolete and conceptually misleading. The word *regroup* also offers no conceptual help to young children. A preferable term is *trade*. Ten ones are *traded* for a ten. A hundred is *traded* for 10 tens.

It is important to note that many children have misconceptions about the equal sign. Students can misunderstand the use of the equal sign even if they have proficient computational skills. The equal sign means --- is the same as **---** but most primary students think that the equal sign tells you that the answer is coming up. Students might only see examples of number sentences with an operation to the left of the equal sign and the answer on the right, so they over generalize from those limited examples. They might also be predisposed to think of equality in terms of calculating answers rather than as a relation because it is easier for young children to carry out steps to find an answer than to identify relationships among quantities. The three examples in this task require that the students understand, and perhaps even act out the stories in order to make the connection from the words they hear (stories) to the equations that represent those actions. An example of each type of subtraction story is provided in this task.

Students might rely on a key word or phrase in a problem to suggest an operation that will lead to an incorrect solution. For example, they might think that the word *left* always means that subtraction must be used to find a solution. Students need to solve problems where key words are contrary to such thinking. For example, the use of the word *left* in this problem does not indicate subtraction as a solution method: Seth took the 8 stickers he no longer wanted and gave them to Anna. Now Seth has 11 stickers *left*. How many stickers did Seth have to begin with? **It is important that students avoid using key words to solve problems.**

Also, students need to check their work to see if their answer makes sense in terms of the problem situation. They need ample opportunities to solve a variety of problems and develop the habit of reviewing their solution after they think they have finished answering the problem. Encouraging students to create a mental picture for what they are reading and to create drawings to represent what is going on in story problems is necessary to help them progress from concrete understandings to more abstract understandings.

ESSENTIAL QUESTIONS

- How can we model and solve subtraction problems with and without regrouping?
- Can we change the order of numbers if we subtract? Why or why not?
- How can we solve problems mentally? What strategies help us with this?
- How can mental math strategies, for example estimation and benchmark numbers, help us when adding and subtracting with regrouping?

MATERIALS

- Various manipulatives (counters, base-ten blocks, etc.)
- "Subtraction Story Problems" student task sheet

GROUPING

Independent

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Task Directions
Give students the "Subtraction Story Problems" task sheet and allow them to solve the problems independently. As students work, walk around asking questions about the students' strategy use. Look to see if students are using the strategy of benchmark numbers or other strategies. After students have completed solving the problems, gather the class in the meeting area. Allow students to share the strategies they used to solve the problems on the task sheet.

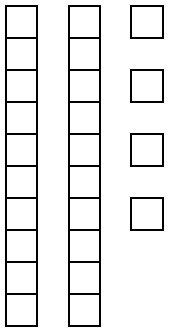
FORMATIVE ASSESSMENT QUESTIONS

- Does changing the order of the numbers in a subtraction problem matter? Why?
- How were the strategies you used similar to your neighbors? How were they different?
- Who can explain someone else's strategy for solving one of the problems?
- Did someone else's strategy make more sense to you? Why?

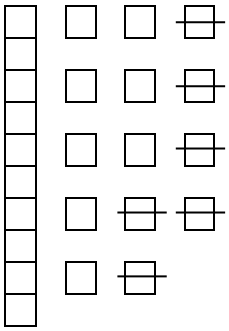
DIFFERENTIATION

Extension
- Give students this two-step addition and subtraction with regrouping problem to attempt to solve. *Olivia picked 15 yellow daisies and 17 white daisies. She gave 26 of the daisies to her mother and kept the rest. How many daisies did Olivia keep for herself?*

Intervention
- Have students build a subtraction problem with base ten blocks and then draw pictures to represent their problem.
  Example: 24 – 16



Since 6 ones cannot be taken from 4 ones, regroup a ten into 10 ones.



Subtract 6 ones (show this by crossing out 6 boxes).

Name: _____ Date: _____

Subtraction Story Problems

1. Julio had 23 crickets in his bug collection. He allowed 17 to hop away. How many crickets does Julio still have in his collection?

2. Samantha had a large stuffed animal collection. She decided to share 9 of them with needy children. Now she has 27 animals in her collection. How many animals did she have in her collection to begin with, before she gave some away?

3. Jack loves jellybeans. He had a bag with 32 jellybeans in it this morning but he ate some at lunch. Now he has 18 in his bag. How many jellybeans did Jack eat at lunch?

PRACTICE TASK: Menu Math

Approximately 1 Day

In this task the students will create a menu, estimate and add prices of purchases and determine change.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

MCC.2.MD.8 Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. *Example: If you have 2 dimes and 3 pennies, how many cents do you have?*

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
   Students are using a problem solving approach to create and use menus.
3. **Construct viable arguments and critique the reasoning of others.**
   Students are explaining and defending their strategies to estimate, add, and subtract.
6. **Attend to precision.**
   Students are using precise mathematical language to create and use their menus.

BACKGROUND KNOWLEDGE

Students should have had prior experiences and/or instruction with addition and subtraction of numbers up to 100 with and without regrouping. Students should also have experience adding and subtracting coins with coins and dollars with dollars.

ESSENTIAL QUESTIONS

- How can we solve subtraction problems with and without regrouping?
- How can addition help us know we subtracted two numbers correctly?
- How do I express money amounts?

MATERIALS

- Gift cards with money amounts (Examples: $20, $50, $80)
- Class menu
- Calculators
- Menu Math recording sheet

GROUPING

Partners

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Ask students if they have ever been to a restaurant. Have them list some things they would see at a restaurant. Let the class decide what kind of restaurant to create. Brainstorm a name for the restaurant. One suggestion would be to use your school name and mascot. Vote and take tally marks to determine the class' favorite name. Have students list the types of drinks, appetizers, entrees, sides, and desserts they would like to serve at their restaurant. This list will serve as the class menu (you may have students make paper menus if desired). Assign prices to each of the items available on the menu. Prices need to be in dollar amounts.

Separate the children into pairs. One of the two children in each group will be the customer and the other student in each group will be the waiter/waitress. The customer should begin by choosing a gift card. The student then chooses one to two items from the menu. The waiter/waitress takes the order and tallies the bill. Meanwhile, the customer should estimate his/her bill. The waiter/waitress gives the bill to the customer. Using estimation, the customer should decide if the bill seems correct. The customer then pays with his/her gift card and figures out how much change he/she should get. After the customer writes down the total and the change, the waiter/waitress may check the math on a calculator (serves as the register). All work should be saved and turned in. Students should switch roles and play again.

After several experiences playing, this task becomes a great center.

FORMATIVE ASSESSMENT QUESTIONS

- What strategies helped you estimate your bill?
- What strategies did you use to add the actual amounts?
- What strategies did you use to find out how much change you should get?
- Do you think it is more difficult to be the customer or the waiter/waitress? Why?

DIFFERENTIATION

Extension

- Students have a gift card of $100 and can choose three items from the menu.

Intervention

- Give the student a $20 gift card. The student should choose one item from the menu.

Name _____ Date _____

Menu Math

How much is your gift card? _____

What would you like to order? _____

What do you <u>estimate</u> as the <u>sum</u> of your meal?

$_____

+ $_____

_____

What is the actual <u>sum</u> of your meal?

$_____

+ $_____

_____

Do you have enough money to purchase this meal? _____

How much change will you get back?

$_____

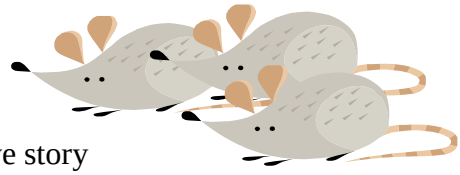
- $_____

_____

Gift Cards

Gift Card Amount **$20**	Gift Card Amount **$30**
Gift Card Amount **$40**	Gift Card Amount **$50**
Gift Card Amount **$60**	Gift Card Amount **$70**
Gift Card Amount **$80**	Gift Card Amount **$90**
Gift Card Amount **$100**	

Constructing Task: Counting Mice



Approximately 2-3 Days

In this task the student will use and defend various strategies to solve story problems developed from literature.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

MCC.2.MD.10 Draw a **picture graph** and a **bar graph** (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems[2] using information presented in a bar graph.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
3. **Construct viable arguments and critique the reasoning of others.**
   Students are explaining and defending their strategies to regroup/trade.
4. **Model with mathematics.**
   Students represent and use base ten block, number lines, 99 chart, and pictures to solve subtraction problems.
6. **Attend to precision.**
   Students are using precise mathematical language to explain their strategies.

BACKGROUND KNOWLEDGE

(Information quoted from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades K-3, pages 68)

"Notice that in the separate problems, the initial amount is the whole or the largest amount, whereas in the join problems, the result was the whole. Again refer to Figure 3.1 as you consider these problems. Be sure you can identify what quantities are the initial, change, and result amounts."

ESSENTIAL QUESTIONS

- How can we solve subtraction problems with and without regrouping?
- How can addition help us know if we subtracted two numbers correctly?
- How can I use a number line to help me model how I combine and compare numbers?

MATERIALS

- *Mouse Count* by Ellen Stoll Walsh or similar counting book
- "Counting Mice" recording sheet

GROUPING

Partners

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Some Subtraction Types		
Problem Type	Action or Situation	Number Sentence
Separate, result unknown	Snake has 42 mice in the jar. 17 escape. How many are left?	42 – 17 = ?
Separate, start unknown	Snake has some mice in the jar. 17 escape. 25 are left. How many did he have at the start?	? – 17 = 25
Separate, change unknown	Snake has 42 mice in the jar. Some escape. 25 are left. How many escaped?	42 – ? = 25

Part I
Read the book *Mouse Count* by Ellen Stoll Walsh or a similar book to the class. While reading ask students to think about how they could act out the story using place value blocks, model it on the number line, and/or show how it could be solved using a 99's chart. Once you finish reading the story post this scenario on the board:

Snake was very hungry one day and put 25 mice in the jar before he took a nap. He put 17 more mice in the jar after his nap. How many mice are in the jar all together?

Have students go back to their desk to figure out how many mice are in the jar altogether. Provide paper, pencils, and crayons available for the children to use to help them solve their problem. Also allow students to use a 99's chart or a number line to model their thinking. Have students work alone at first for a few minutes, but sitting in groups to observe and discuss each

other's strategies after having a few minutes to work independently. As students work, look for a variety of strategies and/or solutions. Before asking students to share, plan which solutions should be shared and in which order they should be shared. In this way students are exposed to strategies/solutions that would add to students' understanding of numbers and solving problems. After students have had an opportunity to finish their work, let several children share the strategies they used. Create a class chart to document the strategies.

25 + 17
Strategies We Used

(a) I counted on from 25 (25 . . . 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42)
(b) 20 +10 is 30, and 5+7 is 12, and 30 + 12 is 42
(c) 25 +10 is 35, plus 5 more is 40, plus 2 more is 42
(d) I took 5 away from the 17 and made 25 into 30. Then I added 12 (from the 17 – 5) and got 42
(e) I drew circles (0000000000000000000000000 00000000000000000)
25 17

Be sure to ask questions like the following for formative student assessment:

How did you solve the problem?
Can you write a number sentence (make a picture, make a model) that shows your thinking
How do you know your answer is correct?
Can you solve this problem in a different way?
Are you able to use the number line to model how you solved this problem?

Part II
After reading, acting out and modeling the story, explain to the children that you have made up a new version of the story about Snake. Gather the students together and say:

"Snake was very hungry one day and put 25 mice in the jar before he took a nap. He put 18 more in after the nap. Then he went outside to play. When he came back in there were only 14 mice in the jar! Help Snake figure out how many mice escaped!"

Have paper, pencils, and crayons available for the children to use to help them solve their problem. Remind them that they need to use pictures numbers and words to help show their thinking. Also provide students with a number line, a 99's chart, and place value blocks available for students to use to model their thinking. Have students work alone at first, but sitting in groups to observe and discuss each other's strategies. As students work, look for a variety of strategies and/or solutions. Before asking students to share, plan which solutions should be shared and in which order they should be shared. In this way students are exposed to strategies/solutions that would add to students' understanding of numbers and solving problems.

After students have had an opportunity to finish their work, let several children share the strategies they used. Make sure to create a class chart to document the strategies as in Part I of this task.

Comment
Look specifically for any students who use a number line or 99's chart to model their work. Make sure to share this strategy with the class. If it is not offered, then demonstrate to the students how you could use a number line or 99's chart (look in Unit Overview for more detailed examples).
A student who uses a 99's chart might say…
"I used a 99's chart. I started at 25. I moved down one row which is 10 more, then moved to the right 8 spots and landed on 43. This represented the 18 more students coming into the cafeteria."

At this point, gather students together to create a bar graph of the different strategies students have used to solve the problem (99 chart, base 10 blocks, trading algorithm, number line, etc.). Engage students in questions such as:

- Which strategy did most students use?
- Which strategy did the fewest students use?
- What is the difference between the amount of students who used _____ and the students who used _____?
- How many students used _____ or _____? (In this type of question, the word "or" often confuses children. Teachers should provide numerous opportunities for children to solve this type of question.)

Part III
Hand out the student task sheet *Counting Mice.* Have them work independently to solve the problems on the sheet. Remind students to use pictures, symbols, numbers and words to show how they are thinking about and solving the problems.

FORMATIVE ASSESSMENT QUESTIONS

- What strategy did you use?
- Were you able to write a number sentence, draw a picture, or make a model that shows your thinking?
- Would someone else be able to understand how you thought about the problem by looking at your work?
- Did you check your answer? How do you know your answer is correct?
- Can you explain how a neighbor solved this problem in a different way?
- How did you decide what to do to solve the problem?
- Are you able to use the number line to model how you solved this problem?

DIFFERENTIATION

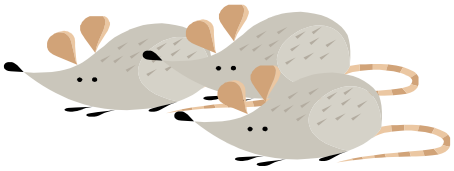
Extension

- Have students write another version to the Snake story or other story problems and describe strategies they could use to solve them.

Intervention

- Give students more experiences with regrouping using base ten blocks. Also provide more experiences for them to use the 99's chart and the number line to model the addition and subtraction they are doing.

Name _____ Date _____



Counting Mice

1. Snake was very hungry one day and put 25 mice in the jar before he took a nap. He put 17 more mice in the jar after his nap. How many mice are in the jar all together?

2. Snake has 49 mice and his cousin Rattles has 27 mice. Who has more mice, Snake or Rattles? How many more does he have?

3. Use your answer to #2 to begin. Snake and his cousin Rattles put their mice together in one big tank. 17 of the mice escaped. How many mice do Snake and Rattles have now?

PRACTICE TASK: Every Picture Tells a Story

Approximately 2-3 Days

In this task the student will write number equations and story problems developed from pictures.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
   Students are making mathematical sense of pictures and forming equations.
3. **Construct viable arguments and critique the reasoning of others.**
   Students are explaining and defending their strategies to regroup/trade.
6. **Attend to precision.**
   Students are using precise mathematical language to explain their strategies.

BACKGROUND KNOWLEDGE

(Information quoted from Van de Walle and Lovin, Teaching Student-Centered Mathematics: Grades K-3, page 66)

"Researchers have separated addition and subtraction problems into categories based on the kinds of relationships involved. These include *join* problems, *separate* problems, *part-part-whole* problems and *compare* problems."

For illustrations and further elaborations refer to pages 66-70.

ESSENTIAL QUESTIONS

- How can subtraction help us to know if we added correctly?
- How can addition help us know if we subtracted correctly?

MATERIALS

- *Math Appeal* by Greg Tang or similar addition riddle story
- Pictures from magazines
- Paper

GROUPING

Small group

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I
Gather students together on the meeting area. Read *Math Appeal* by Greg Tang or similar addition riddle story. Discuss addition pictures with class and have students answer riddles as you read the story.

Show students a picture from a magazine. Make sure the magazine picture offers several possible groups or combinations and would be interesting. Discuss the picture with the whole class. The children may want to ask questions that can be answered by the picture, but do not require an operation and can be found by counting. Possible examples:
There are 6 groups of 2 dogs pulling the sled. How many dogs are pulling the sled?
There are 23 mice in the picture. 15 are under the table. How many are on top of the table?

Part II
Give students a picture from a magazine or a coloring book. Try to make sure the pictures have several number combinations for two-digit numbers. Have students describe what they see in their picture and create number sentences to match their descriptions. Encourage students to check their answers using the inverse operations. As students are working on their number sentences, walk around and ask questions like:

- What numbers do you see within your picture?
- How can you use these numbers in an equation?
- How are you describing your picture with number sentences?
- How can you check your answer to see that it is correct?
- Is there another number sentence you could write with those numbers?

Part III
Have students create a story problem to go along with one of the number sentences (equations) that they wrote for the picture. Let students share their story problems and pictures with the class. Allow other students to ask questions or make comments about the student's work. See if students can come up with additional story problems for each picture.

FORMATIVE ASSESSMENT QUESTIONS

- What numbers do you see within your picture?
- How can you use these numbers in an equation?
- How are you describing your picture with number sentences?
- How can you check your answer to see that it is correct?
- Is there another number sentence you could write with those numbers?

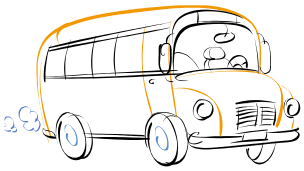
DIFFERENTIATION

Extension

- Students create or choose their own pictures and write story problems based on their creations or pictures.

Intervention

- Provide story frame for students to complete and illustrate. Example: Joey has _____ balloons. _____ balloons popped. How many balloons does Joey have now?



CULMINATING TASK: Planning a Field Trip

Approximately 2-3 Days

In this task the student will plan for a field trip: number of buses needed and number of food items needed for lunches. The students will also write story problems based on their graphed data.

STANDARDS FOR MATHEMATICAL CONTENT

MCC.2.OA.1 Use **addition** and **subtraction** within 100 to solve one- and two-step word problems involving situations of **adding to**, **taking from, putting together, taking apart,** and **comparing,** with **unknowns** in all positions, e.g., by using drawings and **equations** with a symbol for the **unknown** number to represent the problem.

MCC.2.OA.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.

MCC.2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

MCC.2.MD.8 Solve word problems involving **dollar bills, quarters, dimes, nickels,** and **pennies, using $ and ¢ symbols** appropriately. *Example: If you have 2 dimes and 3 pennies, how many cents do you have?*

MCC.2.MD.10 Draw a **picture graph** and a **bar graph** (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems[3] using information presented in a bar graph.

STANDARDS FOR MATHEMATICAL PRACTICE (SMP)

Although all standards for mathematical practice should be applied regularly, this task lends itself to the standards below:

1. **Make sense of problems and persevere in solving them.**
   Students participate in a lengthy, multi-step task requiring them to use a variety of mathematical skills.
2. **Reason abstractly and quantitatively.**
   Students make mathematical sense of information and form solutions.
3. **Construct viable arguments and critique the reasoning of others.**
   Students determine the number of buses to be used, graph data, create and solve story problems collaboratively.
4. **Model with mathematics.**
   Students use pictures and graphs.
5. **Use appropriate tools strategically.**

Students use pictures, graphs, and problem solving strategies.

6. **Attend to precision.**
   Students plan the field trip, bus numbers and cafeteria order, using mathematical communication skills.
7. **Look for and make use of structure.**
   Students use mental math strategies to plan for buses and food orders.
8. **Look for and express regularity in repeated reasoning.**
   Students may use guess and check or other shortcuts to make sense of the task.

BACKGROUND KNOWLEDGE

In order to complete this culminating activity, students should have prior experiences solving two digit addition and subtraction problems, with and without dollar symbols. Students should also feel comfortable analyzing their strategies for problem solving and sharing these strategies with the class.
Students should be comfortable composing and decomposing numbers in multiple ways as a strategy that can help them add and subtract two digit numbers. For example, students should be able to think about 25 as 20 and 5 as well as two 10's and one 5 as well as 12 and 13, etc. This demonstrates fluency with numbers and is evidence that the students is ready to proceed with further conceptual and procedural understandings with numbers.
Additionally, students should have had multiple opportunities to draw picture and bar graphs and solve simple problems using information presented in the graphs.

ESSENTIAL QUESTIONS

- How can we solve addition problems with and without regrouping?
- How can subtraction help us to know if we added two numbers correctly?
- How can addition help us know if we subtracted two numbers correctly?
- What strategies can help us when adding and subtracting with regrouping?

MATERIALS

- School Population Documents
- Any of the Magic School Bus books
- Large Sheet of Chart Paper and markers
- Brown paper lunch bags or other small containers
- "Planning a Field Trip" picture cards
- "Planning a Field Trip" Cafeteria Order

GROUPING

Large group, partners

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part I
Gather students together on the class meeting area. Read one of the Magic School Bus books. Tell students we are going to plan for our upcoming field trip. (If you are not going on a field trip, tell the students they are going to plan for the field trip in the story.) Ask the students to help figure out how many buses they would need for a school field trip and what is the least expensive way to order them.

Have a list of all the classes in the school and the number of students in each class. The actual number of classes you include in the problem will depend on the size of your school. It is recommended that the total be a three-digit number. If the school is very small you may include all the classes. If the school is large you may want to include only a few grade levels.

Pass out "Planning a Field Trip" student task sheet. Have the students work with a partner to figure out how many of each kind of bus the school should rent and how to spend the least amount of money. Have each pair make a poster of their strategy for determining the total number of students and the recommended number of buses.

By this time, most students should be more fluent in multi-digit addition. After the students have found the total number of students, they will need to find ways to makes groups of 20 (or 12) to determine how many buses are needed. Some students may guess and check multiples of 20 (or 12). Encourage a variety of methods.

Have the students make posters of their processes (for example, drawing pictures and decomposing and composing the numbers to make groups of 20 or 12).

Have the partners share their posters with the class. Compare the various options. Have students write in their math journals which were the top three options in their opinion and tell why.

Part II
Gather students back together on the class meeting area. Tell them that we also need to plan our lunch for the field trip because we will not be eating in the cafeteria. They will have the choice of a sandwich, bags of carrot sticks, and/or juice box for lunch. Every student will be able to choose what items will put in their lunch bags. (Possible choices could include: only a sandwich, a sandwich and juice, carrot sticks and sandwich, OR all three – ONE, TWO, OR ALL THREE DIFFERENT ITEMS.) Explain to the students that the cafeteria will need to know the correct quantity of each item to prepare for our trip.

Students then go back to their seats and cut out the item(s) to put in their paper bag. Students will place 1, 2, or all 3 items in the paper bags. Students return to the carpet to graph their data on a large chart paper in either picture graph or bar graph format (or do both and compare the two).

Part III
Using the data gathered from the class graph, each student will create 3 story problems. These problems can be directly based on the class data or it can be based around topics surrounding the class field trip. These problems should involve addition and/or subtraction within 100. The students should create an answer key using pictures and words.

FORMATIVE ASSESSMENT QUESTIONS

- How many buses will we need for the field trip?
- What strategies did you use to add?
- Looking at our graph, what do you notice?

DIFFERENTIATION

Extension
- Have students write questions that can be solved from using the information on the class bar or picture graph that was created.
- Give students a price per student lunch and have them find the total cost.

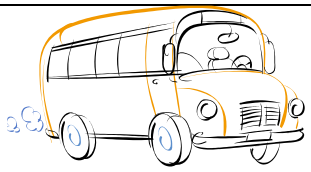
Intervention
- Students who are having difficulty with the operations may complete the task for one or two grades.
- Students can place clip art pictures on each student's name on the graph to assist with counting and tallying.

Name _____ Date _____

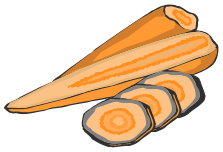
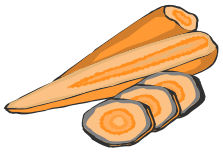
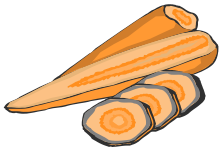
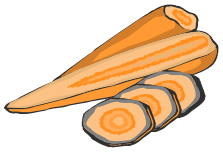
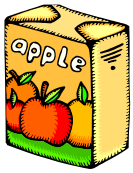
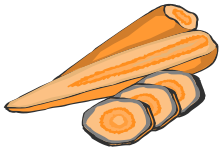
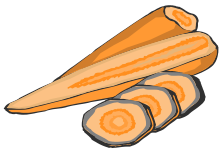
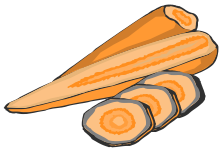
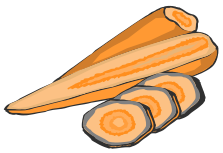
Planning a Field Trip

Directions: Work with your partner to determine how many of each kind of bus the school should rent and spend the least amount of money. Show your work. Explain your thinking.

Large bus holds 30 people - Rental $10
Small bus holds 12 people - Rental $ 5

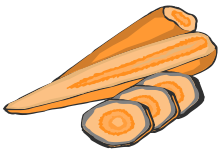


Planning a Field Trip Picture Cards

sandwich	carrot sticks	juice box
		
		
		
		
		
		
		
		

Name _____ Date _____

Planning a Field Trip Cafeteria Order

Please order the following quantities for our field trip.	
Sandwiches: 	
Bags of carrot sticks: 	
Juice boxes: